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Double Plunger Compound Condensing Pumping Engine.

The placing of a steam and water cylinder in line with each other, and connecting the pistons of the two, or the piston of one and the plunger of the other, rigidly together, thereby doing away with the usual connecting machinery and its friction, while reducing the strain in direction to a straight line, was, unquestionably, a great step forward in the science of steam engineering. In spite of the opposition naturally engendered by so radical an innovation, the progress of the direct-acting steam pump towards popularity has been somewhat phenomenal, until to-day no single type of steam-using machine is so universally favored by the engineering fraternity.

Notwithstanding, however, the actual economy of such a pump of moderate size, in which it would not be desirable under any circumstances to employ expansion to any considerable extent, and where any slight loss from a lack of employing expansion would be more than neutralized by simplicity, and by the reduction of friction; when the same principle is made use of in pumps of large size, the fact that the constant resistance of the water, and the absence of anything to serve the purpose of the fly wheel, limits the use of expansion to a low rate, is a serious objection.

To overcome this objection, and for other economic reasons, advantage has been taken of the fact that in using two steam cylinders, as in the compound engine, in one or both of which the steam is expanded, the power is much more regularly or equally applied than where the same expansion takes place in a single cylinder. By this means, and by proper attention to the relative size of the two cylinders, a reasonable amount of expansion may be secured, and the pump brought to the condition of good economic workings so far as the consumption of steam is concerned, while preserving the freedom from friction, and other important advantages of the direct-acting pump.

Our engraving represents a double plunger compound condensing steam pump, or pumping engine, recently brought out, and which is calculated to meet the requirements of the highest attainable duty in this class of pumping machinery.

The particular pumping engine here illustrated has a high-pressure cylinder 18 inches in diameter, a low-pressure cylinder 34 inches in diameter, while the pump plunger is 16 inches in diameter, with a stroke of 24 inches. In the design of this machine the intention has been to make simplicity of construction prominent, and the result is that while it possesses distinctive economical features, they are so arranged as to be readily come at and understood by the ordinary mechanic.

Referring to the engraving, it will be seen that the high-pressure cylinder is placed nearest the pump cylinder, to which it is attached by four distance rods, while the low-pressure cylinder is bolted directly to the end of the high-pressure cylinder. There is, however, no connection between the interiors of the two cylinders, the piston rod of the high-pressure cylinder extending directly to the pump plunger, while the low-pressure piston is connected to the plunger by two piston rods, which pass along the outside of the high-pressure cylinder through bronze sleeves provided with stuffing boxes at their outer ends, in such a way as to bring the three piston-rod stuffing boxes in line, and near together. These sleeves are properly supported by the front cylinder head of the high-pressure cylinder, and the arrangement makes the low-pressure piston-rod stuffing boxes easy of access. The sleeves are encased by the covering of the high-pressure cylinder, so as to in no way destroy the general symmetrical appearance of the engine.

The valve motion of the high-pressure cylinder is the same as that of the Davidson steam pump, described in our issue of Aug. 6, 1881, and the low-pressure cylinder is fitted with a flat slide, which is connected to, and moves with the valve of the high-pressure cylinder. The peculiar operation of the steam valves is such as to make the travel of the pistons practically constant, which enables the clearance to be reduced to a minimum, and also permits the unobjectionable use of ports of large area.

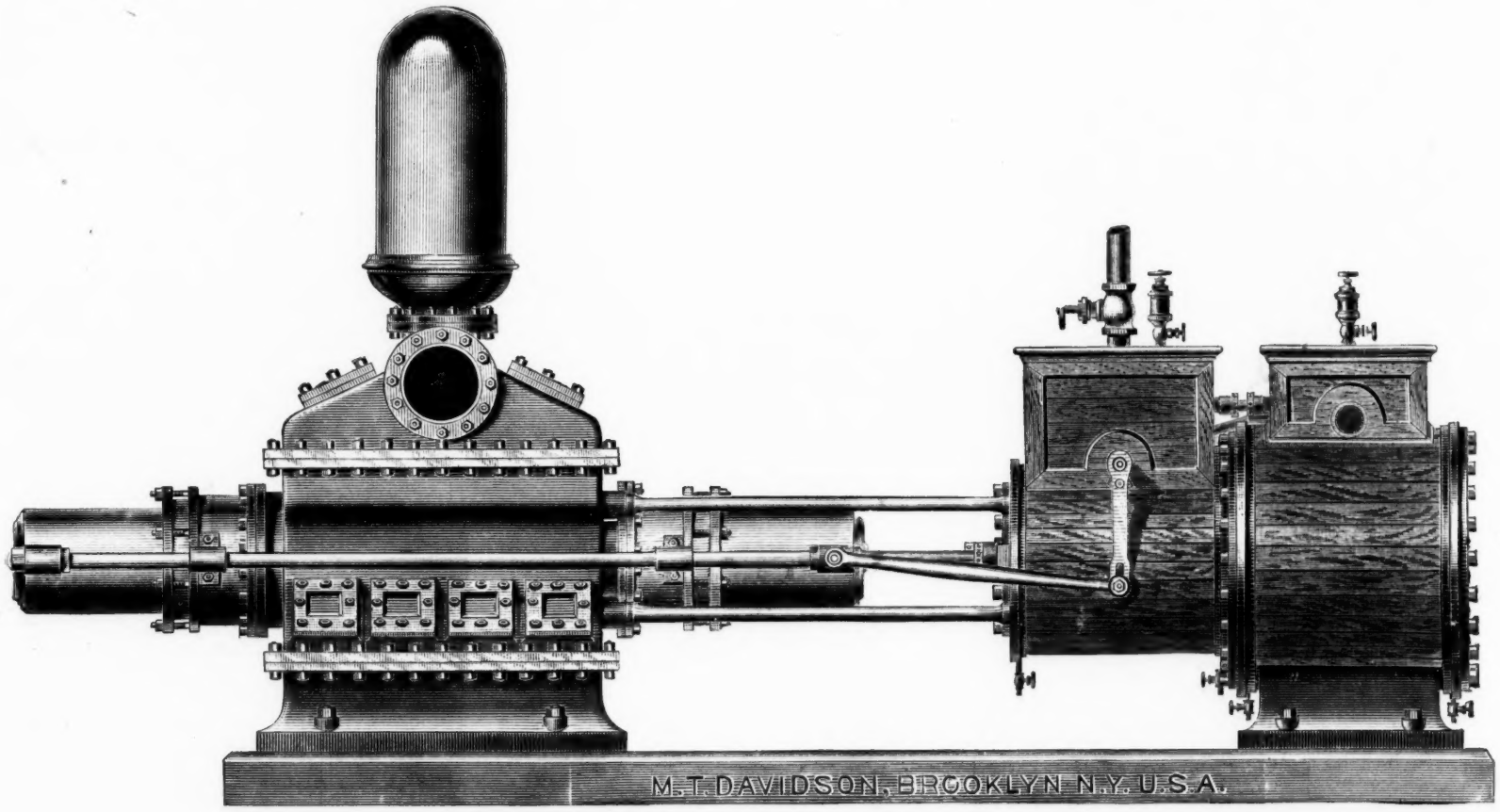
The stuffing boxes and glands of the pump plunger are bushed with bronze to protect the plunger, and to provide for easy renewal should they become worn. The pump valve area is large, and the valves are arranged so as to be readily accessible.

Altogether, the claim for a simple and reliable pump of large capacity, and one in which the various parts may be come at with ease and dispatch, and which may be quickly taken apart and assembled again by an ordinary intelligent mechanic, seem to be well established.

With these engines is used the independent air-pump and jet-condenser, described in our issue of October 1, 1881.

These pumping engines are made of any capacity required, and of any relative size of steam and water cylinders to suit the head. They are designed for city and town waterworks, dredging and mining, and, in fact, for any purpose, where large quantities of water are to be handled.

They are manufactured by the Davidson Steam Pump Company, 41 to 47 Keap St., Brooklyn, N. Y.



DOUBLE PLUNGER COMPOUND CONDENSING PUMPING ENGINE.

Use of Standard Gauges in Shops.

BY ALBERT H. EMERY, C. E.

In the midst of very pressing work I stop to write a few words on the construction and use of standard and set gauges in the shop.

In making my testing machine I had to make and use many of them—perhaps nearly or quite 300 of various sizes, from 1″ to 20″ in diameter of circular gauges, and .01″ to 100″ for linear and step gauges—most of which I had made at the shop or shops where working.

The great mass of mechanics do not begin to realize the value of the use of good standard gauges in making machinery of all kinds. Had I, at the commencement of the construction of my testing machine, bought $500 worth of these gauges and presented them to my workmen, I should have been greatly the gainer in constructing this one machine.

When a man has to dress a piece to fit a given hole, he must measure the hole to find its size, and with the tools most commonly found he never finds its size. Then, of course, the piece to go in must be measured over and over again, as reduction goes on, until near the size. When he wishes to try it in it will not go while too large, and in the absence of knowing the exact diameter of the hole he is to fit and that of the piece he is fitting, he does not know whether to take off .001″ or .004″ for the reducing chip. Much time is spent in taking off thin chips for fear of taking off too much, until at last, tired and out of patience in trying to carefully remove the unknown amount which prevents the entrance of the part into its seat, and which appeared to him, on measuring, as almost or quite nothing (but which

may be very considerable and not found by him, owing to the spring of his calipers), he finally takes too much off, and the piece is irreparably loose. Had he been supplied with good measuring tools, and been skilled in their use, he might have quickly determined the exact size of the hole and that of the piece he is turning, and so know just how thick a chip to turn off, and the true calipers would show him just how much he was taking off.

The use of correct measures in rapidly reducing these parts, or enlarging the holes for them, schools the eye of the workman to know approximately what thickness of chip he is removing. Soon he becomes expert in making a good fit to a standard, much more quickly than he could before make a poor fit to the hole of unknown size.

Whenever practicable, all parts to be fitted should be fitted to standards, which, being of known size, the parts already fitted to these are of known size, and need not be measured, and we may by gauging find just the amount to dress off the piece to be fitted. We should thus know just what chip to remove to fit it, and can at once turn down almost to that size, and then the experienced gauger will soon bring this part to the standard, as practice has taught him to know if he is removing .001″ or .003″, while the man who does not use gauges can hardly or at all guess the thickness of the chip he is removing. Furthermore, many parts cannot in any case be tried together while being dressed.

In making my testing machine, many parts were fitted in different shops, and so could not possibly be tried together in fitting. Many could not have been fitted to each other directly, even if they had been in the same shop, and, in general, none of them were fitted to each other. In almost all cases they were fitted to the gauges. By this manner of fitting, other parts can be made at any time hereafter to take their places, fitting equally well. Another marked advantage of the use of standard gauges is found (especially in all smaller holes), in being able to use to a greater extent in their production, drills and reamers of standard sizes.

One form of gauge I used extensively was that which I call the plate gauge, as it is made of plates, as shown in Figs. 1 and 2, the former being a 3″ male gauge, and the latter the corresponding female gauge. These are of steel, usually nickel-plated, and should be from .1″ to .15″ thick, depending on the size. The proportions of *a*, *b* and *c*, shown in the drawing, are suitable for small gauges, but will change as the size increases. Thus, in a 30″ gauge, these proportions may be respectively, 2″, 3″ and 30″. That part of the gauge which makes the gauging face should be hardened, and then ground to size. The gauge may then be plated, and the nickel removed from the gauging face. Great care should be used to have the face straight, and faces *f* and *g* at right angles thereto, and hence parallel. Of the male gauges (Fig. 1), the opposite sides should be parallel and straight, the working faces hardened, and each corner a right angle exactly. Gauges of this kind should all be interchangeable. Thus, the 2″ and 3″ male should fit the 5″ female, and the 10″ and 5″ male fit the 15″ female; the 10″ and 20″ male fit the 30″ female, and failure to do this shows that all are not right.

Should any male be $\frac{1}{2000}$″ smaller than the corresponding female, it can be felt to be loose, and the ear will detect it striking when slipped backwards and forwards in the other, as even in moving this $\frac{1}{2000}$ of an inch free, it will strike the face of the other sufficiently for this. For ordinary work these gauges, if more than 5″ or 6″ long, should have wooden handles fastened to them on opposite sides for the fingers to rest against, as the heat of the hand rapidly distorts them.

Thus, if a piece were closely fitted to a 20″ gauge in a room at 60°, and this plate were held in the hand twenty seconds, it would no longer fit. This shows us that the gauges should, in general, be of about the same temperature as the piece being gauged.

For cylindrical gauges, I use many ring gauges of the form shown in Figs. 3, 4, 5 and 6; Figs. 3 and 4 showing the male, and Figs. 5 and 6 the female, to a scale of one-half. Fig. 7 shows the section of a larger one to the same scale. These are all of cast iron, which should be very hard close iron, and dressed on lines marked *D*. Dimensions with a small circle around them in my drawings, indicate to the workman that they are to be carefully fitted to gauges. This designation I put on all drawings. In the case of these gauges, these gauged dimensions should all be carefully ground to size, and in a manner to leave them both true and smooth.

Whenever it is practicable, it will be better to buy these gauges than to make them. The standard plug and ring gauges made by the Pratt & Whitney Co., and the caliper and micrometer gauges made by Brown & Sharpe, are most admirable, and almost indispensable. The micrometer 1″ gauge is by far the

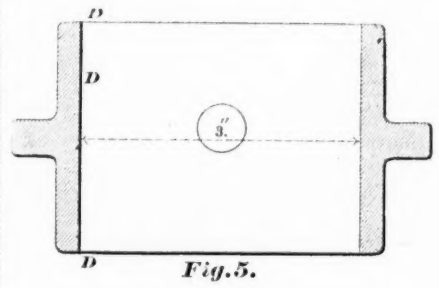


Fig. 5.

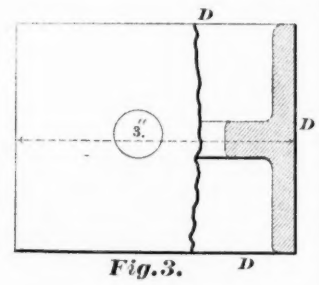


Fig. 3.

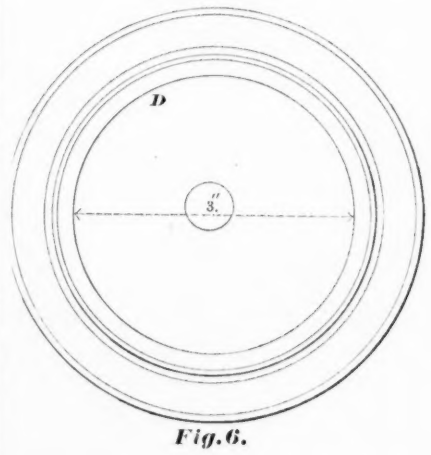


Fig. 6.

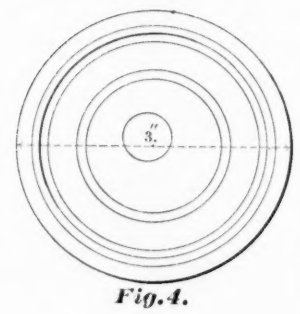


Fig. 4.

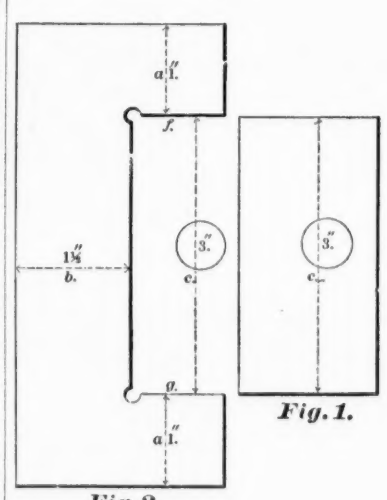


Fig. 1.

Fig. 2.

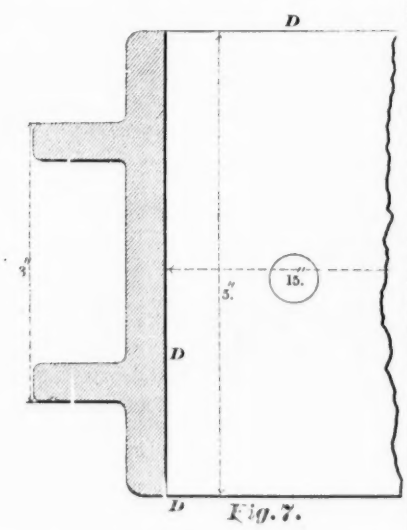


Fig. 7.

best and most convenient gauge known to me, and it is a great pity they do not make these to measure up to at least 15″.

Thus, there should be one for all sizes from 0 to 1.1″; then one to measure all sizes between .9 and 2.6″, 2.4″ and 4.1″, 3.9″ and 6.1″, 5.9″ and 8.1″, 7.9″ and 10.1″, etc., etc.

All above the inch should have wooden bearings to handle them by, so as not to communicate the heat of the hand while in use. For easy, quick reading they should all have the part that is graduated made larger, and the marks coarser than now made, so as to be read quickly, without the aid of a glass or a strong light.

These micrometer gauges are vastly superior in use to the caliper gauges which are graduated by the vernier to $\frac{1}{1000}$″ and which cannot be relied upon for any closer measurement, ordinarily. The latter are slow of use and uncertain, the former, quick and sure. A good gauger will usually, with these micrometer gauges, get the $\frac{1}{1000}$ of an inch, and much more quickly and certainly than he will the $\frac{1}{1000}$ with the caliper gauge. They would be much more convenient, if the pitch of the screw thread was made .02″–.05″ or .1″ instead of .025″ as now. The pitch of .02″ might be used for the small sizes, and .05″ or 1″ for the larger ones.

Below 3″ the plug and ring gauges of Pratt and Whitney already referred to, which are most carefully and admirably made of very hard steel, should be used in preference to the cast iron ring gauges mentioned Their standard screw thread gauges are also very fine. The 1″ Brown and Sharpe micrometer gauge, though graduated to thousandths, readily reads to $\frac{1}{5000}$ of an inch. This firm makes the same form for 25 millimeters, graduated to $\frac{1}{50}$, but readily reads to $\frac{1}{200}$ of a millimeter.

Their caliper gauge referred to, is made of three sizes to measure respectively lengths of .06″–12″ or 24″, each being graduated to read from 0″ to their maximum length by thousandths on their verniers, and cannot be read or depended upon for any finer measurement. They are graduated in inches on one side in the decimal system, and 64ths on the other, or in inches on one side by decimals, and the metrical system on the other. They are indispensable in the machine shop.

Another form of caliper gauges for set measurements is made by the Betts Machine Co., of Wilmington, Del. For boring and turning these are very desirable. For making and testing these and other gauges, the standard measuring machine, made by the same company, is very desirable, if properly made, but the writer is unacquainted with the quality of its work.

Whatever other successes the Paris Electrical Exhibition may have achieved, it is undoubtedly consoling to the stockholders that, financially, they are $80,000 a head.

Railway Construction in 1881.

The year 1881 has been especially notable for the enormous extent and rapidity of railway construction in the United States. Although it opened with a very severe winter, and snow and frosts, protracted into the spring, delayed the commencement of operations in a large part of the country, and although during the summer and fall, railway work in the west was retarded by an excess of rain and mud, still we are able thus early to present a table giving, we believe, a comparatively complete summary of the number of separate lines, and the miles of track actually laid down in the various states and territories since the first of January, 1881. As the month of December has been unusually mild in the northern half of the country, considerable track no doubt has been laid within the last few days, of which we have as yet received no report. It is probable, also, that in some other cases, the last reports have not shown the entire amount of track laid or that will have been laid at the end of this month. While, therefore, the figures which we are now able to give are necessarily incomplete, and will have to be supplemented in a future article giving the record of construction in detail, we may say that it has been made up with very great care from numerous sources, railway managers, state railroad commissioners, and other state officers contributing their assistance, and that it is reasonably complete for so early a publication.

Our figures show that track has been laid on 258 different lines—although not by as many different companies—and already aggregates no less than 8,242 miles. This is much the largest mileage ever constructed in any one year, that for 1880 being given by Poor's manual at 7,174 miles, which in turn was far greater than the mileage added in any previous year except in 1871, when it reached 7,379 miles. Allowing for returns yet to be received we believe it is safe to estimate that the track laid in the United States in 1881 will prove to have been very little, if any, less than 10,000 miles

The following is the table, as far as we are now able to complete it, of the construction in 1881:

State.	No. of Lines.	Miles.
Alabama	1	14
Arkansas	4	109
Arizona	1	97
California	2	73½
Colorado	15	493
Dakota	10	430½
Florida	4	103
Georgia	6	54½
Iowa	14	486½
Illinois	14	341
Indiana	11	375
Kansas	6	159
Kentucky	5	143½
Louisiana	2	236
Michigan	12	289½
Massachusetts	7	49½
Minnesota	9	182
Missouri	11	229
Maine	2	32½
Montana	2	156
Mississippi	3	68
Maryland	2	25
New Hampshire	2	7½
Nevada	2	133
North Carolina	7	149
New York	15	223½
Nebraska	5	247
New Jersey	8	66½
New Mexico	4	339½
Ohio	10	417½
Oregon	2	38
Pennsylvania	10	94½
Rhode Island	1	1¼
South Carolina	2	67
Texas	20	1411
Tennessee	5	87
Virginia	8	273½
Vermont	1	2
West Virginia	1	12
Wyoming	1	25
Washington Territory	4	269½
Wisconsin	7	281
	258	8242

It will be seen that the work of railway

extension has been carried on in 42 States and Territories, the only States in which no new track is reported laid being Connecticut and Delaware, and the only territories thus distinguished being Idaho, Indian Territory and Utah, although it is probable that a few miles were laid in the latter. The remote possession of Alaska, of course, does not come into this category. Texas leads the country in respect of railway building, having added last year, by our table, 1,411 miles, which final returns will probably increase to 1,500 or more. Colorado appears to come next, with about 500 miles, of which no less than 370 are officially reported to us as laid by that enterprising narrow-gauge railway company, the Denver & Rio Grande. This company built during the year no less than 10 different lines or portions of lines. Iowa comes next with nearly 500 miles, and Dakota and Ohio also show thus far between 400 and 500 miles. Indiana, Illinois, New Mexico and New York appear to have added between 300 and 400 miles.—*The Railway Age.*

Mechanical Drawing.

BY PROF. JOHN E. SWEET.

WHOLE AND SPLIT PULLEYS—BRACKETS FOR TURNING PULLEYS—OLD AND NEW METHODS OF CONSTRUCTING PULLEYS, ECCENTRIC STRAPS, ETC.—EXAMPLES OF JOURNAL BOXES.

In the last paper on drawing, it was hinted that the pulley subject might be a good one for the student or apprentice to experiment with; and it may be found, like many others, to grow wonderfully as the investigation progresses. If one begins to study the subject from observation, he will find an endless variety and many curious examples, with as many scientific reasons from the designers, pattern makers and moulders why each is correct, as he will find kinds of pulleys.

The scientifically correct he will find with broken arms; the practically correct with broken arms, and those that are all wrong in proportion he may find as sound as could be desired.

While in general practice it is desirable to keep all the parts of a casting as nearly of equal thickness as possible, and the thinner the metal the more desirable this becomes; still in making belt pulleys this is impracticable, since arms and bosses as thin as the rim would be too light, or the rim would be too heavy. Make the drawing to meet the requirements, and the foundrymen will find a way to make the pulley. If you have the good fortune to find a Sellers' pulley for a sample, try and study out what there is about it that so many who have endeavored to counterfeit it have never found out; that is, find out what constitutes the difference between the original and the counterfeit.

The fewer arms there are in a pulley the less likely it is to crack in casting; but six arms for pulleys of all common sizes is a better number than any other, for then the pulley can be held for boring and turning by

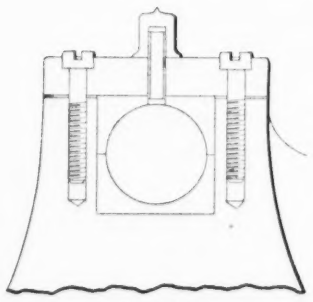


Fig.35.

each alternate arm without putting any strain upon it.

By far the best method of holding pulleys for boring and turning is the one devised by W. H. Craig, in which are used three very strong cast iron brackets, shown in Figs. 29 and 30. These brackets are secured to the face plate by bolts at equal distances from the center of the lathe, and equal distances apart. The set screws coming through the slots of the face plate and the set screws in front, grasping the arms, admit of adjusting the pulley true sidewise, while the three radial screws coming against the inside of the pulley give a ready means of setting it true and holding it firmly.

All pulleys, hand-wheels, and the like, that are to be turned in part, and left partly as cast, should be set by the part that is not to be turned. Thus the unturned portion will run as true as it can be set, and the turned part will be made true by turning.

In making the drawings of a pulley, some time may be saved by drawing center lines

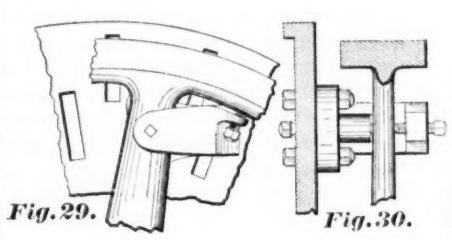


Fig.29. *Fig.30.*

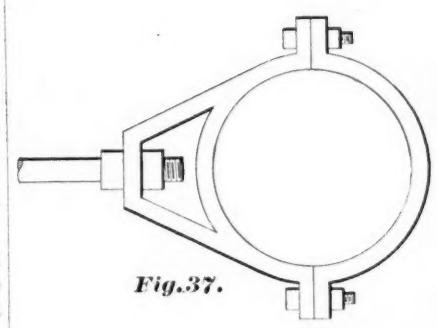


Fig.37.

Fig.32

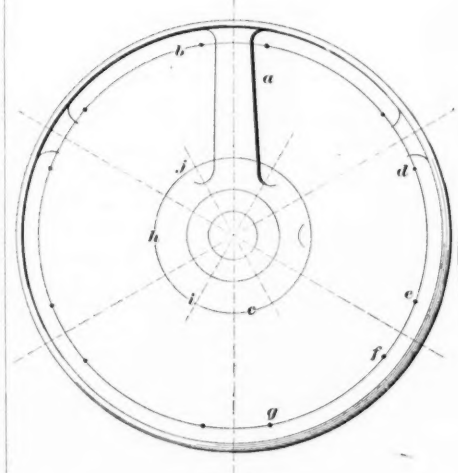


Fig.31

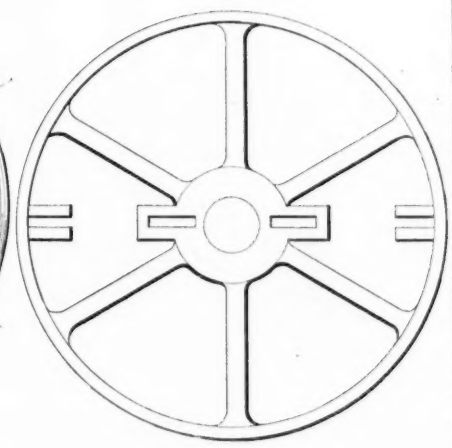


Fig.33

through the six arms, as shown by the dotted lines in Fig. 31. Next, complete the drawing of one arm, as at *a*, strike two circles, *b* and *c*, through the compass centers, and upon these circles set off from the center lines the compass centers *d*, *e*, *f*, *g* and *e*, from which the circles at the ends of each arm can be struck, and from these the straight sides of the arms can be drawn, without making any other measurements.

The study of the subject of pulleys may

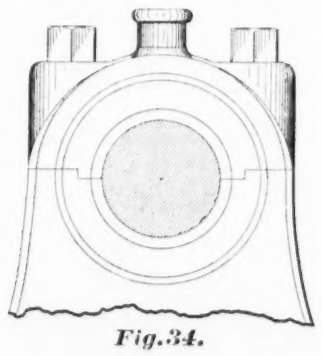


Fig.34.

embrace that of sectional or split pulleys, and if no other lesson is learned, this may be, viz., the difference between the practice of modern machine designers, in the treatment of minor details, and the practice of the fathers of this generation.

Fig. 32 gives an example of split pulleys that illustrates this characteristic difference, when compared with Fig. 33. The bolts used in the former figure, to clamp the two halves of the boss together, are as close to the shaft as they well can be, and if tightened until something gives way, it will be the cheap bolt, and not the costly pulley that breaks.

The later method of joining the ends of the rim is less unsightly than the old way; and by removing one of the pins the two halves of the pulley may be opened like a door hinge, and placed on the shaft much more conveniently than if completely separated.

This bolting of two parts together around a shaft, or round piece, is an important detail in machine work, and is employed in putting together a large percentage of the journal boxes in use, in nearly all eccentric-rod straps, in some connecting-rod ends, and in many other places.

Fig. 34 shows a journal box for lathe spindle by Sellers; Fig. 35, something for the same purpose by Pratt and Whitney; Fig. 36, one of the common kind; Fig. 37, an eccentric strap of the old sort; and Fig. 38, one according to later practice.

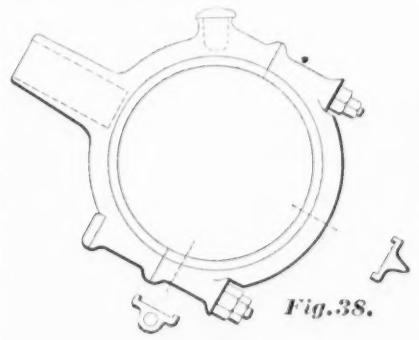


Fig.38.

All these examples illustrate the same general principle, and the drift of the best practice. The modern way is more mechanical, whatever that means, and costs more, but the result is far more satisfactory, and is the correct thing to follow. If you copy the right sort, and leave the wrong one to look at, the chances are that, when you come to draw some machine in which this principle is involved, you will adopt the best.

Fig. 37 shows the common method of joining the eccentric strap, and Fig. 38 a better one, for it is very difficult, if not impossible, to bore one of the first-shown straps truly circular, and then set it in place and have it

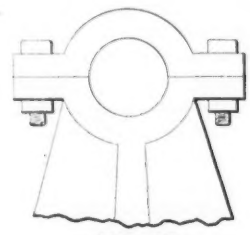


Fig.36.

still true. The tightening of the bolts, more or less, will spring the strap in a greater or less degree out of truth; while that shown in Fig. 38 will remain true, however tight the bolts may be drawn.

The Position of the Skilled Mechanic.

No matter to what extent the refinement in machine tools may be carried, it is in the end the careful and painstaking operation of the skilled mechanic that must bring the products of these tools to a perfection that will meet the requirements of modern demands. The lathe will not turn so round that, in this respect, its production cannot be improved by the hand work of the skilled machinist, nor will the milling or planing machine produce surfaces so true that he is not called upon to rectify them with the file and scraper. Now, as ever, the beautiful finish on iron and steel is the result of the individual effort of the operator, rather than of the perfection of tools.

Years ago, the opinion prevailed to a considerable extent that the services of the highly skilled mechanic would not be so much a matter of necessity in the future as in the past, but those who built on such grounds built poorly. The man will always be superior to the machine, and must always see better than he can perform.

One man may direct the efforts of fifty skilled workmen to the production of good work, but fifty men cannot get good work from one unskilled workman. Improved tools and mechanical appliances will simply assist the artisan in the production of fine work, but the greater the refinements of these tools and appliances, the greater must be his skill. Instead of relieving him of his responsibilities, which would be in every sense a misfortune, they add to them, which make him, in every way, the better, in being able to meet them.

Altogether, the position of the skilled mechanic is in every way satisfactory, in its relation to improved machine production, and the tools and appliances of the future, however refined, can never usurp his place in the industries of the world, nor relieve him of the part he is to play in future mechanical advancement.

English Mechanic and World of Science says:—

For making cement for leather belts, take of common glue and American isinglass equal parts, and place in a glue pot. Add water to cover the whole. Soak ten hours. Then bring the mixture to a boiling heat, and add pure tannin, till the whole becomes ropy or like the white of eggs. Apply warm. Buff off the grain of the leather where it is to be cemented; rub the joint surfaces solidly together; let it dry a few hours, and it is ready for use. If properly put together no rivets will be needed, as the cement is as strong as the leather.

We have known ten dollars paid for a recipe for cementing belts, similar, but not quite equal to this.

Among the awards at the recent Atlanta Exposition is one to a young lady for an "Alabama Poodle." The cultivation of poodles thus far has obtained but little prominence as a Southern industry, but in many of our Northern cities it is diligently pursued by parties who have abundance of capital to sustain their business.

LETTERS FROM PRACTICAL MEN.

Fast Melting and Other Foundry Matters—Mr. West replies to Mr. Kirk's Criticism.

Editor American Machinist:

If, after writing for a year for so widely a read paper as the AMERICAN MACHINIST, there appeared no one to criticise, or to condemn some of my articles, I might well feel that they received but little consideration; hence I feel like thanking whoever or whatever called Mr Kirk's attention to my article, "How to Melt Iron Rapidly," which appeared in your issue of July 16th, 1881, and I also feel like thanking Mr. Kirk for paying attention to me in issue of Dec. 31, notwithstanding he waited six months after the appearance of my article.

The first difficulty, according to Mr. Kirk's view, appears to be in my statement that there were no practical hints in published works on the true cause of fast melting; in answer to which he asks: "What more notes or hints a practical founder or melter could want than a full description of the cupola, tuyeres, blast, fuel and mode of charging?"

With reference to charging up—Does he think it is only necessary to tell a man just how many pounds of iron and coal to throw into the cupola in order that he may remedy slow melting?

In my opinion, the long table of charges and the elaborately full description of an elegant cupola, situated, perhaps, 100 miles away from a melter who is trying to do his melting in an apology for a cupola, would be of but little practical use to him. I believe that for a melter troubled with slow melting, there are other things of considerable more importance than a table of charges, which things may appropriately be classed under the head of notes and hints. Will Mr. Kirk deny that it is of the utmost importance, for instance, to have the cupola properly daubed up, instead of having two or three inches of clay put on to fall down amongst the fuel and iron, thereby causing more delay in melting than any of his tables of charges will remedy? Or, to make sure the fire is in proper condition before charging up with iron? Or, to properly distribute the large and small iron, and get the coal to proper size? Does it make no difference whether the light or heavy pieces of iron are charged first, or last, or whether the staging is kept clean, and any dirt, riddled, or otherwise got out from amongst the small pieces?

When the fire gets to burning poorly, as it sometimes will, are there not "notes and hints," in reference to fixing it, that would be of value to those who had not lived long enough to know it all; and is there nothing in placing the iron so that the flame and heat can strike as much surface as possible?

Let a melter get everything down fine in his cupola, find out just how to charge up, varying his charges until he gets first class results every time, and then let him make out an elaborate table, carry it with him to another foundry—same size cupola—and I think when he undertakes to run this cupola by his table he will be satisfied that there are a good many other things quite necessary to know.

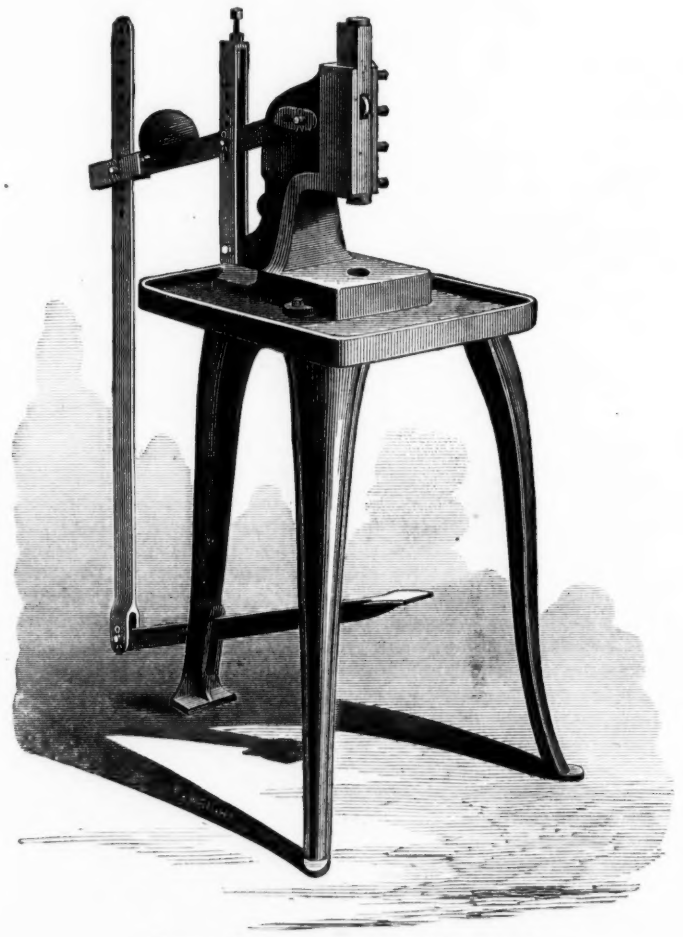
The weights of charges from some foreign foundry are the minor part of the melter's knowledge, if of any value at all. To become a good melter he must study cause and effect in relation to everything he does, from the time he picks out the cupola till he drops the bottom, and any one of the details referred to, and which Mr. Kirk ignores, will furnish abundant material for all I can well say in a single article in the AMERICAN MACHINIST.

Mr. Kirk takes exceptions to my objections to so high a charging door as he advises, for a cupola in which different grades of iron are to be melted at one heat, such as iron for a cylinder, for a pulley, and a roll. In reference to this the word *lighter* should have been used instead of *poorer*, my argument being that the lighter grade of iron at the top would melt before reaching the melting point. Evidently Mr. Kirk's experience in melting has been in a stove foundry, and as he says in the AMERICAN MACHINIST of June 8, 1881, that he does not make a business of melting iron, he is excusable for not knowing more about the practice of a jobbing foundry. He does, however, appear to take pride in having run a heat for a cylinder, with the balance of the charges of soft iron, and without (as he says) any mixing of the different grades. Suppose Mr. Kirk, to satisfy himself a little further on this subject, will select some foundry where the foreman of the machine shop makes things lively when he gets a hard pulley, and instead of charging with hard iron first, put in one charge of soft iron, the same weight of iron and coal he calls for, and on top of that a charge of light hard iron. Let him then cast some pulleys, and to make it interesting stay around till they are being turned in the machine shop. My opinion is that about that time it will be more interesting for him to tackle the machine shop foreman on almost any other subject than on that of the melting point of a cupola. Mr. Kirk evidently thinks he has me at an advantage with reference to my statement that the upper charge, if of a lighter grade of iron, would melt before reaching the melting point, and get mixed with iron of another quality. By the melting point, I mean, as is well understood, that position in the cupola where by virtue of the highest temperature the *most* melting is done. It would be a very absurd conclusion to reach however, that *no* iron was melted until it reached that point. That part of a cupola that gets burned out, is from about six inches above the tuyeres up from two to three feet, and this simply indicates that iron melts all along that distance and, out of this distance six inches may be taken as the melting point, or point of greatest heat; but since iron melts to some extent as stated from two to three feet up, it follows that as different grades of iron melt at different temperatures, and as the height where iron may melt is sufficient to contain two or three charges, there is always, as I stated, danger of the iron getting mixed in the melting. Mr. Kirk says in substance, that if good charges of coal are used between the charges of iron, and if the iron *is tapped out as fast as melted* it will not mix. Now it may be practicable in a stove foundry to do this, but in a jobbing foundry it is well known that this cannot be done. In fact, when melting for a heavy casting as much as 5000 pounds of melted iron is often allowed to accumulate in the cupola before tapping out. By this means the upper charges will be in a melting condition before they reach the regular melting point.

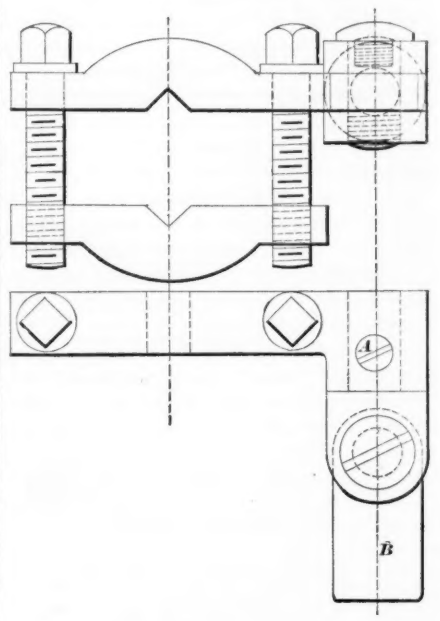
The company that I am at present engaged with have in their foundry two cupolas, one for heavy and one for light heats. As I happened to be running the small one the day after reading Mr. Kirk's letter, I told the melter to fix it up in good shape, having his iron and coke clean, and then I saw the engineer and asked him to examine his fan and belts, and to see that they were all right. The cupola was charged up, as described above (not by Mr. Kirk's plan, but by the one I wrote about), and the blast was put on at fifteen minutes past 4 o'clock. The bottom was dropped at 24 minutes past 5 o'clock. The size of cupola was 30 inches; the amount of iron melted, between 7,700 and 8,000 lbs. The weight of coke used on the bed was 455 lbs., and the charges of iron were 500 lbs. each, with 65 lbs. of coke between every charge. The iron used was all pig for the first two charges, after which there was 200 lbs. of pig and 300 lbs. of scrap mixed. My plan may not be practical, and may require more coke, but such assertions, coming from a man who has traveled so much, only goes to show that he has not seen everything there is to be seen.

When Mr. Kirk criticises me again, will he kindly tell us of a cupola only 30 inches diameter and 9 feet up to the charging door, that can melt four tons of iron in one hour and nine minutes from the time the blast goes on till the bottom drops?

THOMAS D. WEST.



LEVER PRESS ON TABLE.—See page 5.



A Peculiar Dog.

Editor American Machinist:

I enclose a sketch of a bitch dog, with adjustable and moveable horn, designed for use in milling.

Any one familiar with the use of a Brown & Sharpe Universal Milling Machine knows that the horn of the common solid bitch dog never comes at right angles in the slot of the face plate, and particularly when they have to mill any taper which necessitates dropping the head center below the tail-block center, or *vice versa;* and, therefore, must certainly cramp the work, which makes it an impossibility to mill any work with both sides correct. The teeth of a gear should be cut from the centers of the machine, as any chuck, no matter how true, will soon be nothing to depend upon. In such a job this dog will overcome all objections, and cut a perfect running gear, as the horn is always flat in the slot of face plate, and firmer than a solid one.

To use the dog on any taper work, loosen the screw *A*, to allow the stem of the fork to revolve and slide in the body of the hub of dog; swing the tongue *B* into the slot of face plate, and hold it with set screw in plate.

On parallel work the screw *A* can be set up, after the tongue has been screwed down in face plate.

Any one familiar with the use of a Brown & Sharpe machine will see at a glance the benefit this dog will give them.

The dog can also be used in turning, where parties are obliged to use straight lathes to turn a taper.

I have several of these dogs in use at the Morse Twist Drill and Machine Co.'s works, and find they overcome the only fault in the B. & S. machine.

CHAS. H. MALMEDIE,
Foreman of Reamer, Cutter, Mill, etc., Department.
New Bedford, Mass.

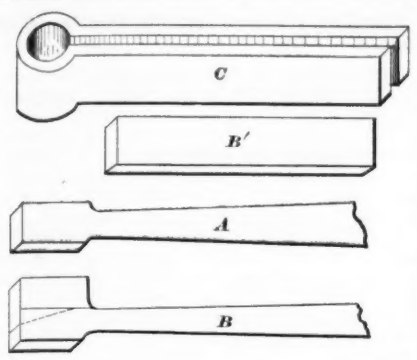
Device for Making Chasers.

Editor American Machinist:

The device as shown in annexed sketch once served me a good purpose. With your permission, it may be useful to others.

I received an order from a brass-fitting manufacturer, to make a pair of chasers, who must have them right off to match some work to be shipped next day. A tap one inch diameter was sent me to match. It had an odd thread, three large flutes, and was considerably relieved, so that I could not use it as a hob. I could not make a hob, as my lathe would not cut the thread; I was, however, anxious to make the tools.

After forging the blanks, as shown, and leaving them to anneal, I made a forging of a piece of iron, $\frac{1}{8}'' \times \frac{1}{4}''$, as at *C*, leaving the hole $\frac{1}{8}''$ diameter, and the space between the



tangs $\frac{5}{16}$" (the thickness of the steel blanks), when by inserting the blank *A*, so that the face of it would complete the hole, with the shank between the tangs held firmly in a vise, I had but to tap the hole to cut the blank, the thread of which I got perfect by occasionally driving the blank on to the tap. The female blank *B*, was easily held with the assistance of the fillet piece B^1, inserted behind, and when cut, the superfluous portion of the blank (which had been nicked with a sharp chisel while hot) was broken off. The details of finishing need not be given ; suffice it to say, the chasers were finished in time, and satisfactorily, W. DICKS.

Toronto, Ont.

Loss of Power in Screw Propulsion.

Editor American Machinist:

In reading Mr. Root's communication in your issue of November 26th, I come to the conclusion that he was mistaken in regard to the power lost by the present mode of screw propulsion; and, consequently, that he must be mistaken as to the amount of power he could save by the mode he proposed to introduce, and, further, that he had made a mistake in working an example according to Rankine's formula for determining the reaction upon a screw's disc. In your issue of December 24th he contends that he made no mistake in taking the pitch of the screw for the speed of the ship, and he goes on to say that, if I take the speed of the ship for the basis of my calculations, etc. Now, I wish it to be understood that I take nothing but Rankine's formula and Mr. Root's example. Mr. Rankine's formula for determining the reaction upon a screw's disc is:

Weight of a cubic foot of water × No. of cubic feet acted upon × speed of slip × speed of ship (both in feet per second); ÷ 32.2

This formula would seem to be approximately correct, as the advance of the ship is the amount of water which the screw takes hold of, and the slip the acceleration impressed upon the water; but Mr. Root, in working his example, substitutes in this formula the pitch of the screw for the speed of the ship, thus taking the slip into account twice.

Mr. Root now disclaims any saving of power by negative slip, but any one would naturally suppose, by the tone of his paper, that this was the sole merit of his system, for he states that, "With a pitch of screw of only 210 feet, the vessel advanced 360 feet." This would make a negative slip of nearly 75 per cent., which is by far the greatest negative slip I ever heard of.

He says, further: "I will give Mr. Allen a problem. He makes his screw utilize in thrust upon the boat 85 per cent. of the power of his engine." Now, I wish it to be understood that I do not claim to have any screw, nor did I state that any screw would utilize in thrust upon the boat 85 per cent. of the power of the engines driving it. But what I did say was this : instead of Mr. Root's opinion being correct in regard to the power lost by the screw, viz.:

Tow line	1.00
Cycloidal screw	1.33
Horizontal	2.00

the actual facts of practice would stand thus, with a well-proportioned horizontal screw:

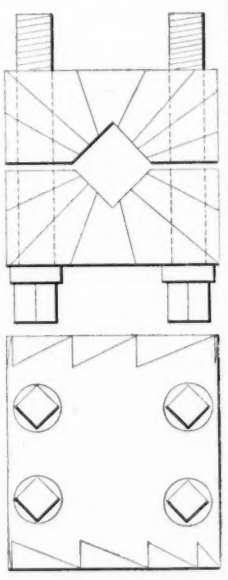
Tow line	1.00
Horizontal screw	1.15

Thus showing a saving of 85 per cent. of Mr. Root's presupposed loss.

Mr. Root seems to be aware of the fact that the experiments of the British Government prove that over 50 per cent. of the indicated power is consumed in the skin friction of the ship, and, I stated before, that Mr. Rankine conceded 60 per cent. consumed in this way. Now we know that 25 per cent. of the power never reaches the screw or the skin of the vessel, but is lost in the friction of the engines, in the friction of the load driven, and in the friction of the screw and its thrust upon its bearings; and this loss from friction we cannot call upon the screw to account for, nor can it be prevented by substituting other screws. Now I will ask him this question: If 60 per cent. of the power is accounted for by the friction of the skin of the ship, and 25 per cent. more by the friction of the engines, friction of load driven, and friction of the screw and its thrust upon its bearings, how much is there left for the screw to account for?

In regard to the experiments of the British Government, they fill volumes. Experiments were made with every conceivable kind of screw, and every known pitch, and angle of inclination. In these experiments the slip varied from 85 per cent. positive, to 18 per cent. negative, and the record states that no form of screw was found, so far as economy of power was concerned, which was better than the true screw properly proportioned to its relative resistance, and that used horizontally.

There are any number of cases among the experiments of the British Government which will confirm the above, and I will cite one of them which took place in 1845. This was the trial of the propeller Rattler, of the British Navy, which was made under steam only, and when the weather was calm and the water smooth. During this trial the mean speed achieved by the Rattler was 9.2 knots per hour. The slip of the screw was 10.2 per cent. The indicated power of the engines was 334 horses. The forward thrust upon the screw shaft, measured by dynamometer, was 7,789 lbs. The horse power of the shaft, obtained by multiplying the thrust in pounds by the space passed through by the vessel in feet per minute, and dividing by 33,000, was 247 horse power. This makes the ratio of the shaft to the engine power as 1 to 1.3. Now I can assure Mr. Root that the coefficient of performance of modern steamers is greater than that of the Rattler, so that his chances of saving more than is lost is very small.



New York. JOHN F. ALLEN.

Tool for Squaring-up Boxes.

Editor American Machinist:

In squaring up the ends of journal boxes that form a part of the frame of a machine, or are so situated that they cannot be removed for squaring up in the lathe or planer, the usual practice is to chip and file them.

Sometimes, where there is considerable of this kind of work to do, a plain, flat cutter is fitted in a bar, but the operation of such a tool is not satisfactory. A very good tool for such work is the flat-ended rose mill, but as such a mill can only be used for one-sized journal, the providing of a full set of them for different sizes is quite expensive.

I send you with this a sketch of a clamp mill cutter, that, I think, is a very handy tool, which may be used on different-sized bars to suit the size of journals, and which, observation leads me to believe, is not so generally used or known as its merits deserve.

The two pieces of which the mill is made may be of any size to suit the range of work done in a shop. The mill shown was made from bar steel 1" × 2¼" and 3" long, with a 90° groove planed in each piece to a depth of $\frac{7}{16}$". It will square up boxes for any sizes of journals from $\frac{3}{8}$" to 1¼". The teeth should not be cut radially but irregularly, as shown, so that whatever the size of bar used, the end of one or more teeth will come against it.

The manner of clamping the mill to bars of different sizes is shown in the sketch, and the manner of using it requires no explanation. JOHN F. KIRBY.

Boston, Mass.

The Atlanta Cotton Exhibition.

THE TURPENTINE AND RAILWAY EXHIBITS—THE NEW SOUTH.

The manufacture of turpentine is another Southern industry, which seems to present opportunities for those who go South to make a home, and engage in business requiring a small capital. The principal amount of rosin and turpentine was manufactured in North Carolina, until late years, when the business has extended further South.

Instead of Wilmington, N. C., Savannah is now the principal place of export for these naval supplies. This industry started in Georgia and Florida about eight years ago, and yet there was exported from Savannah for the fiscal year ending Sept. 1, 1881, 5,470 barrels spirits turpentine, and 282,386 barrels rosin.

The Way Cross Railroad, which extends from Savannah through southern Georgia and across northern Florida, runs through a country abounding in the long-leafed pine, which furnishes the supply of pitch, tar, and turpentine. This railway had an exhibit showing the whole method of gathering and manufacture of this product of the pine tree. Their exhibit was under the charge of Mr. B. Holmes, an experienced manufacturer who carries on the whole process, and was ready to explain matters to all interested.

The crude turpentine is taken from the pine tree by removing the bark from the side of the tree for a strip about three feet long, with a peculiar adze; at the lower end of this place is a deep trough-shaped notch, which collects the crude turpentine as it exudes from the wounds in the side of the tree. The crude turpentine is a pasty, white substance, of a strong pine odor. It is dipped from these notches about once in three weeks, and placed in casks.

To make rosin and the spirits of turpentine, the crude turpentine is placed in a copper still and mixed with water. By distillation, the vapor of spirits of turpentine and water are driven off, and condense in the worm, from whence the mixed spirits of turpentine and water flow into an open vessel. The water being heavier sinks to the bottom, and is there drawn off; the spirits of turpentine runs off from the upper part of the vessel.

The residuum in the still is rosin, which is drawn off, strained and run in casks.

This railroad made this eminently practical exhibit to show the method of utilizing one of the principal natural products of the country near their line.

They have a land grant abounding in pine timber, situated close to the right of way, and back a distance of eight miles from the track, which they are selling from 25 cents to $1.50 an acre.

I was informed that 6667 trees would contain in the aggregate 10,000 "boxes" for gathering turpentine. The annual product of these will amount to 350 barrels of crude turpentine, yielding 35 casks of spirits of turpentine, holding fifty gallons each, and 250 barrels of rosin, weighing 400 pounds each.

At the end of the third year, the tree is dead, having furnished the raw material for eight tenths of a gallon of spirits of turpentine and 45 pounds of rosin.

At the end of the second year the tree is said to be still good for lumber.

In certain portions of eastern North Carolina are forest districts where the pine trees have been killed by turpentine cutting.

This dead wood may yet be utilized by a new process of turpentine manufacture which was exhibited by the inventor, Mr. William Messau, who brought his apparatus from Germany to the Cotton Exposition.

The Messau process subjects the wood to destructive distillation in a retort in the form of a cylinder. This retort is made of sheets of wrought iron riveted together, as in a cylinder boiler, and set in brickwork, with fire-brick under the center of the retort, so that the flames touch the sides of the boiler and not the bottom.

The retort will hold a cord of wood, which is put in through a man hole.

A steam boiler furnishes a supply of steam which is superheated by passing through a steam coil over the fires at the retort. The superheated steam enters the retort with the wood, and the products of distillation are spirits turpentine, pyroligneous acid, tar and charcoal. The tar is drawn off from the retort, and the charcoal removed after the whole is cool.

A cord of dead pine wood produced by this treatment :

100 pounds spirits turpentine,	$7.00
360 " pyroligneous acid,	2.50
1 barrel tar,	1.50
44 bushels charcoal,	2.20
Total value of product,	$13.20

This is not the most profitable method of treatment; by stopping the distillation before the tar is driven from the wood, the residuum forms the brown charcoal, which is more valuable than black charcoal for the manufacture of charcoal iron.

The Southern railways filled two buildings with articles showing the natural resources of the country through which they pass.

There were specimens of building stones, comprising granite, marble, freestone, slate and others ; of minerals used in the mechanic arts, the principal ones are corundum, graphite, mica asbestos, lithographic stone, whetstone, baryta, soapstone, ochre, sienna, chrome, kaolin and coal.

Ores of every metal in use except tin, and also numerous specimens of metals. The fertile soil has produced the fine specimens of grains, fruits and lumber.

In their variety and abundance these products show that these regions possess great intrinsic wealth, and warrant the glowing prophesies which have been made concerning their future.

These railways all have land to sell, and took these measures to spread information about the natural resources of the country along their lines, in order to encourage settlement.

In these few letters, my purpose has not been an attempt to portray the sights of the Exposition ; but to bring to the attention of your readers some of the inducements which the natural resources of the South offer to those who desire to migrate to that district, which presents such an abundance of opportunities for the business man and the inventor to apply their skill in treating the products of the soil and developing the mineral wealth.

The people of the South are beginning to appreciate their own wealth, and there is evidence on every hand that there will be a great increase of business in this quarter.

Northern men who go South will find a generous welcome extended to them by the responsible part of every community.

Atlanta, Ga., C. J. H. WOODBURY.

Lever Press on Table.

The engraving herewith presented (see page 4) represents a lever press, built by E. W. Bliss, Brooklyn, N. Y.

This press is designed for a great range of fine light work, being constructed to receive a large variety of cutting, punching and forming dies, for making pocket-book frames, buttons, and any small work that requires the use of light fragile dies, which, while they do not require any great amount of power to operate, must be used in a machine that is accurately fitted up to prevent breaking.

For that purpose this machine is fitted with the same care as the more expensive power machines, the mandrel or slide having a large and long bearing surface, and being provided with a gib and set screws to adjust for wear.

The lever, treadle and attachments, are of wrought iron.

Our engraving represents the press mounted on a table, which makes it a very complete and self-contained tool, and is undoubtedly the most convenient form. When desired, however, it is furnished without the table, in which form it is adapted to be mounted on an ordinary work bench.

This press is equally adapted to the wants of manufacturers, and to those who have only occasional use for such a tool, and will readily of itself suggest a variety of purposes for which it may be used.

Condition and Prospects of the Machinery Business.

LETTERS FROM LEADING MANUFACTURERS TO THE AMERICAN MACHINIST.

A YEAR OF UNPARALLELED BUSINESS ACTIVITY.

Delamater Iron Works (Engines, Boilers and Machinery), New York, write us:

Regarding our business for 1881, it has been a very good one, and we are to-day employing more men than we have employed at any time since 1873. We are employing at the present time about one thousand (1,000) men; we have orders on hand that would keep our force going for probably four months; there is plenty of work offered in the market in our line, and we look for a larger business in 1882 than we have had in 1881. We are putting up a new building, 50 × 206 feet, which we shall stock with tools for a machine shop. We have bought during the year about twenty new tools, and are erecting at the present time a fourteen-foot face lathe, bought from the Niles Tool Works. Owing to the increased business, our wages have advanced during the past year on an average of about 15 per cent.

The Pratt & Whitney Co. (Machinists' Tools), Hartford, Conn., write us:

The business of the Pratt & Whitney Co. in 1881 exceeded in amount that of 1880 by one hundred thousand dollars. We are now employing about six hundred and seventy-five men, of whom about one hundred and fifty work thirteen hours per day, five days in the week, the remainder ten hours a day. Yet we find it impossible to furnish machinery as fast as it is wanted. The indications are that during the year 1882 we can make up lots of machines before all in the lot are sold, and occasionally be able to deliver a machine upon order, and make average deliveries at two months' notice, against four months of the past year. We now have orders for machinery for delivery as soon as practicable that cannot be executed fully before July, 1882, though meanwhile we can accept and execute other orders for $250,000 worth of tools of other kinds.

Brown & Sharpe Manufacturing Company (Machinery and Tools), Providence, R. I., write us:

We can only repeat what we wrote last year at this time, being still unusually busy in all departments. Our product for 1881 was larger than in any previous year. We are now employing in machine shop over four hundred hands and seventy-five in foundry, which has been enlarged during the past summer, making the moulding room now 265 feet long and 57 feet wide. About two-thirds of the castings made are for outside parties. Orders for larger tools are from two to four months in advance of delivery. Prospects for business seem to be as good as ever.

The Nicholson File Co., Providence, R. I., write us:

The demand for our goods during 1881 exceeds by considerable that of any year in our history, and although our works have been running to their utmost capacity, we have been unable to keep pace with our orders, and at this time find ourselves with a very light and broken stock, with which to begin the new year.

The indications are that we shall not lack for orders during 1882, notwithstanding our new works will be in partial operation in a few weeks.

Poole & Hunt (Founders and Machinists), Baltimore, Md., write us:

We have enlarged our facilities considerably during the past year, and have had a larger force at work than ever before. We are still busy, but will be happy to hear from good parties wanting anything in our line. Prices of materials and labor have advanced, but the prices of the finished productions are, in our opinion, too low.

J. A. Long, Secretary of the Akron Iron Company (Bar and Pig Iron and Hot Polished Shafting), Akron, Ohio, writes us:

I take pleasure in informing you that our business for the year just ended, is the largest we have ever had. The demand, for the past four months, in bar iron and shafting, has been such as to make it positively annoying, both for the manufacturer and consumer, and, looking at the situation *now*, it does not seem as if the situation had improved in this respect. I think the rolling mills west of the Allegheny Mountains were never so nearly overwhelmed with engagements as now, and the majority of them are refusing definite future engagements—a policy which I consider an eminently judicious one at this time. In all this time there has been an entire absence of speculation, the product of the mills and furnaces going directly into the hands of the consumer. The manufacturers having before them the disastrous results of the "boom" of '79, have pursued a very wise policy in the matter of prices, and I believe if any advance is made in the near future, it will be because the trade and market warrant it, and not for the purpose of administering to the selfishness of speculators. As to the year 1882, I can only say that everything looks promising, and it bids fair to be a year of unparalleled activity. The consumption of iron of all kinds seems to be ahead of the capacity for production, but I believe the American iron-maker will be equal to the occasion, and by increased plant and other appliances, will soon restore equilibrium.

The Hancock Inspirator Co., Boston, Mass., write us:

Our business during 1881 has been very much in excess of 1880, and our most sanguine expectations in December, 1880, have been realized. Our actual sales of inspirators have been 10,083 in 1881, against about 6,000 in 1880, an increase of 66⅔ per cent. Our total sales have been over 26,000. Our sales of ejectors or lifters have also largely increased. We are full of orders for the Scoville "Pop" Safety Valves, and expect to sell thousands of them in 1882. We have added $25,000 worth of new machinery and tools during the year, and are now melting about 10 tons of copper and tin per month. We have 125 men employed in our factory; and expect to have as large a proportionate increase of trade in 1882 as in 1881.

Rob't Wetherill & Co. (Steam Engines and Machinery), Chester, Pa., write us:

During 1881 we erected new buildings and placed new tools, increasing the capacity of our works fully one-third. In these improvements we have taken advantage of all the modern ideas. Business has been very brisk, taxing our full capacity; a portion of the year running nights, using the electric light. The wages of our skilled mechanics have been higher than heretofore. In our opinion, the prospects for 1882 are exceedingly good.

F. E. Reed (Lathes, Drills, etc.), Worcester, Mass., writes us:

Business with me has been good during the year, more orders having been received than I could fill. During this time I have fitted up a new room with the latest and most improved tools, which has increased my production about 50 per cent. I have also replaced several of my old tools with new, and am in better shape for business than ever. I think there is not that feverish demand for light machinists' tools that was noticeable a year ago, but there is a steady and healthy demand that bids fair to last for several months at least.

C. W. LeCount (Lathe Dogs, Machinists' Clamps, etc.), South Norwalk, Ct., writes us:

The last has been a good year for me. Business has been very good. I have had to keep putting in more tools, and now I am full. If there is any further increase, I must enlarge. There is a good look for an increased business the coming year.

The Deane Steam Pump Company, Holyoke, Mass., write us:

Our business has been very good the past year, greatly exceeding in amount that of the preceding year. The prospect for the coming year is quite good. We added to our facilities materially since this time last year, having lately doubled our capital stock and erected additional buildings. We stand ready to still further increase during the coming year, both as to capital and new buildings, to give us increased facilities for enlarged production, if state of business should warrant it. We received the gold medal at the Massachusetts Charitable Mechanic Fair, in Boston, both Mr. L. J. Knowles and George F. Blake being the judges. Take it altogether, the year has been quite satisfactory.

Grant & Bogert, Flushing, L. I., N. Y., write us:

We started our new shop six months ago on 14" engine lathes, of which we have completed twenty and have received orders for twenty-five more. We have also begun building 22" lathes and shapers of new designs. Orders are now booked for some months in advance. Our new foundry is now completed, and will soon start up. We shall put in new machinery, and increase our capacity for supplying first-class tools as fast as practicable. The outlook for 1882 is very encouraging.

Gage Machine Works, Waterford, N. Y., write us:

Our business in machinists' tools for the past year has been very good, and we are at this time more than usually busy, having orders ahead in some lines for five or six months. One extra heavy Fox Lathe, 15 in. x 5 ft., of which we make a specialty, meets with ready sales and gives general satisfaction, both with square arbor and turret.

J. A. Fay & Co. (Wood-working Machinery), Cincinnati, Ohio, write us:

It is with pleasure we give you a few brief facts in regard to our business during the past year, and the outlook for 1882 and future. You will remember a part of our works were destroyed by fire in March last. These have been rebuilt and in operation since June. We have also made extensive additions to our hitherto large plant, until we occupy a floor space of over 80,000 feet, or something more than two acres. Equipped with a complete outfit of the best and most improved labor-saving Iron Working Tools adapted to our class of business that money could procure, our business has increased so rapidly, that although we have with our new improvements facilities for employing nearly 500 men, we are taxed to our utmost capacity, and on some lines of goods are several months behind orders. Our home trade has more than doubled, and our extensive foreign trade coming from Africa, Mexico, South America, Australia, England, France, Germany and Russia has been steadily on the increase, and is of the most gratifying and satisfactory character, taxing our facilities to their very utmost.

Lodge, Barker & Co. (Lathes), 602 W. Fifth Street, Cincinnati, Ohio, write us:

We commenced business Jan. 1st, 1881, making engine lathes 18 inches swing, also Monitor lathes for brass finishers; and soon found the demand much greater than we were able to supply. We have to thank your paper for it, as we were entirely unknown, except in a local way, previous to embarking in business. We completely filled the rooms we commenced in with machinery, and have lately moved into the new building at the corner of Pearl and Plum Sts., in the business center of the city. This move gives us two-thirds more capacity, but even now our orders are from two to three months ahead of us. As far as we can see, the prospects for 1882 are very flattering.

The Billings & Spencer Company (Drop Forgings, Wrenches, Drills, etc.), Hartford, Conn., write us:

Our business was never better than during the past year, and the prospect for the coming year was never brighter. We have made additions to our forging shop, and put in more new machinery. We now have running twenty-four drop hammers, five tilt hammers and ten trimming presses, and we are still unable to supply the growing demand for our tools and drop forgings. We have worked up into our regular goods and drop forgings for other parties 292 tons of bar steel and iron during the year 1881. We have just declared a quarterly dividend of two per cent.

George A. Ohl & Co. (Engineers and Machinists), East Newark, N. J., write us:

The past year has been fairly satisfactory; while the prices have not been high, there has been no want of work. We have felt encouraged enough to build a brick addition to our shop to erect our machine tools—our specialty, and to build new tools to increase our product. Our product for 1881 was about one-third more than the previous year, and we hope to double our present output in 1882.

We expect an increase in prices. Our new screw jack has been very successfully introduced, and we expect a large sale for them.

The Lambertville Iron Works (Steam Engines and Machinery), Lambertville, N. J., write us:

Our business for the past year has driven us beyond our capacity. Instead of carrying any stock on hand, as has been our custom, we have been entirely unable to keep up with our orders.

We are just completing a considerable addition to our machine shops, and are laying new track, etc., to give us additional shipping facilities.

The success of our new automatic steam engines promises, in spite of our increased output, to make it impossible for us to meet the demand for the coming year.

S. Ashton Hand (engine lathes), Toughkenamon, Chester Co., Pa., writes us:

Business has been generally good with me during the current year. I have more than doubled the capacity of my shop since this time last year, and have been greatly troubled to obtain the skilled workmen necessary to operate the new machinery added. I am constantly improving my product, and, although business is generally good, find dealers very backward about buying first-class tools, and paying the prices necessary to compensate for the high class of workmanship; but I have firmly made up my mind not to lower the standard of my tools, even should it drive me from the business. I am paying about the same prices for materials as at this time last year, but have been compelled to advance the wages from 10 to 20 per cent. I find lively competition from the Eastern men, some of whom are selling their tools at ridiculously low prices.

The United States Metallic Packing Co., Boston, write us:

Our business for 1881 has been excellent, a large number of mills, boats, pumping stations, etc., having been supplied with our spring packing. Among these the Boston Sewage Engines, with all the auxiliary pumps and engines attached to this system, have been packed. We have also made a perfect success in packing trip hammers.

In our locomotive packing the prospect for 1882 is most flattering. Several legal decisions have established our rights in our patents. Long and severe tests on first-class roads during the past three years have resulted in gaining for our packing a splendid reputation, of which we are now reaping the benefit. In short, our business never looked better

E. P. Bullard (Dealer in Machinery), New York, writes us:

The volume of my business for the year 1881 was nearly double that of the previous year, and the closing months showed no decline as compared with the early part of the year.

The Stow Flexible Shaft Company, Limited, Phila., Pa., write us:

We cheerfully say a few words about our business, because it has been very satisfactory. The sales in 1881 increased more than 40 per cent. over those of 1880, and the character of the parties who bought has risen gradually, until now we have on our books, as regular customers, the very best railroads and general shops in the country. We moved into larger quarters less than two years ago, thinking we had room enough for five years to come, but our business has increased so rapidly that we shall have to find some way to increase our shop to keep up. We are running more hands than ever before, and yet our finished stock decreases continually.

The Babcock & Wilcox Company, New York, write us:

We are doing a very large business in our water-tube boilers, averaging about twenty orders and four thousand horse power per month, with a constantly-increasing business. We are enlarging our facilities to keep up with orders, and are building branch works in Glasgow, Scotland, equal to the capacity of those here. The prospect for 1882 is better than in any previous year.

Rollstone Machine Company (Wood-Working Machinery), Fitchburg, Mass., write us:

We are much busier than we have been for several years, last month's shipments covering nearly every State in the Union, and have just shipped several machines to Mexico and Australia, with a large order for Russia going forward in a few days. We have lately increased our facilities by putting in new and improved tools, making additions to our works, giving increased room for office, stock room, engine and boiler room, etc. We find it impossible to keep any stock of machinery ahead, and have orders for delivery next April, it being as early as we can furnish some of our machines. Our new descriptive catalogue is just out.

D. Saunders' Sons, Yonkers, N. Y., write us:—

We are now employing 86 hands as compared with 55 hands one year ago. We have added new tools, which, with our increased force, enable us to produce 65 per cent. more machinery and tools than we did a year ago. Our pipe cutting and threading machinery is generally adopted by the trade. The prospects for 1882 are fully as bright as for 1881.

The Norwalk Iron Works Co. (Steam Pumps, Steam Engines, Air Compressors, &c.,) South Norwalk, Conn., write us:

We have been during the last year, and are still running, 13 hours daily on our specialties. We have also much more work "in tow" now than at the corresponding time last year.

F. Armstrong, Bridgeport, Conn., writes us:

My sales of stocks and dies have exceeded my most sanguine expectations during the year. My sales for the last two months have nearly equaled the sales for the six months preceding. I attribute this unprecedented result to two or more causes, viz., liberal advertising, and to users, in discovering the intrinsic superiority of my stocks and dies over every other kind in the market. Orders are coming in from every part of the country, and I have sold to the U. S. Government several bills for use in the revenue cutter service. From the remotest corners of the country I receive requests daily for my circulars and price lists, which are almost invariably followed by an order for my stocks and dies. It looks now as though I should be obliged to enlarge my works, in order to be able to supply the increasing demand.

David W. Pond (Iron Working Machinery,) Worcester, Mass., writes us:

During '81 we largely increased our busi ities for the production of iron-working machinery, having added new buildings, special tools, &c., &c. We find ready sale for products, and believe that the demand for tools during '82 will be greater than the immediate supply.

The Empire Portable Forge Co., Cohoes, N. Y., write us:

We take pleasure in saying that for the past year we have been very busy. The demand for our forges and blowers has increased 40 per cent. over our best previous year. We have added during the year a new line of cheaper forges than our regular "Empire Forge," what we call the "Western." It has had an unusual run. We have also put on the market a new and very strong hand blower, made with a wrought iron frame, which takes the lead over all others on account of its strength, lightness, and durability. We are employing more hands than ever before, and find it difficult to keep our assortment unbroken. Our export trade and far west demand is unusually brisk, proving to us that as fast as *good* articles are known they will be called for in preference to *cheaper*.

We shall make a large advertising venture during 1882, and send out 400,000 pamphlets in connection with other manufacturers who wish to reach the same trade.

We also propose during the coming year to *add* a new large portable forge, to take the place of the unsightly brick and mortar now in *use* in most blacksmith shops, to which will be attached our Western Blower for hand or power, so that we can furnish a forging shop entire with forges, *not* stationary, but at same time as large, convenient, and more durable.

The Harrison Boiler Works, Philadelphia, Pa., write us:

We enter the new year with every assurance of doing a large and increasing business. The manufacture of the boiler was necessarily discontinued for some time after the death of its inventor, Mr. Joseph Harrison, Jr; but a little over a year ago the present proprietor, Mr. J. S. L. Wharton, took hold of it, and has been much pleased with the extent and nature of the business done since, for apart from new custom he has had many orders from parties having used the boiler for ten to fifteen years, and who, having to renew or increase their power have again selected the Harrison, thus proving their appreciation and satisfaction with services rendered.

Cohoes Iron Foundry and Machine Company, Cohoes, N. Y., write us:

The business of the past year has been the largest in the history of this company, and we open 1882 with unfilled orders sufficient to run us for four months. We could work double the number of men now in our employ. The number of new boilers now being set in this country must be very large, if the demand for our boiler specialties is any index, and the amount of shafting which we are under contract to deliver speaks emphatically of the extension of every line of manufacturing which we supply. I believe this year will be a prosperous one for our and the general business. Beyond that time we are both too ignorant and too wise to predict.

Woodbury, Booth & Pryor (Steam Engines), Rochester, N. Y., write us:

Our business of 1881 has been satisfactory; prospects for 1882 are fine. By aid of improved tools and special ones adapted to our particular make of work, and an increased number of them, our product for 1882 will be greater than that of 1881, which was an increase over 1880.

The Crosby Steam Gage and Valve Co., Boston, Mass., write us:

In consequence of the increasing demand for our goods we were compelled, during the past summer, to move into larger quarters, with greatly increased facilities and additional machinery, but since then we have had to buy more tools and machinery, at a cost of several thousand dollars, at two different times. Sometimes we have had to run the factory fourteen hours per day, and yet orders were two and three months behind. Now we are having all we can do, and the prospect is, we shall have to order another lot of tools in a short time. Our business has increased during the year 1881 more than 50 per cent., but this has been *our* experience for several successive years.

Ralph R. Osgood (Dredging and Excavating Machines) Troy, N. Y., writes us:

My business, which is a specialty, has kept me unusually busy during the past year. I have built nine of my improved Boom Dredges, varying in capacity from 500 to 3,000 cubic yards per day; have had a prosperous year, and the present outlook is flattering for the year we are just entering upon.

George B, Grant, Alden Street, Boston, writes us:

My report might be a copy of that of last year, with the addition that my business has nearly doubled within the year, mostly due to increased local demand for gear cutting.

The Westinghouse Machine Company (Engines, Crushers and Heaters), Pittsburgh, Pa., write us:

Although this company has not completed the first year of its existence, orders have accumulated very rapidly, and our business prospects for the incoming year wear a decidedly favorable aspect. We have been constantly increasing our working force, and will at an early date take possession of a new and commodious shop, 75×100 ft., just erected, which, in addition to the one we now occupy (264×100 ft.), will give us ample facilities for the control of a large and growing trade.

Schleicher, Schumm & Co. (Otto Silent Gas Engines), 3045 Chestnut Street, Philadelphia, write us:

Our sales during this year show a large increase over those of previous years. We attribute this mainly to the generally prosperous state of business all around, and in part to the addition of new sizes of our "Otto" gas engines, which now range from one to twenty-five horse power, and are all in demand for the greatest variety of applications. We have just completed the erection of new shops, 50′×206′, three stories high, which we will occupy soon, and expect then to satisfy the demand of the purchasers with more promptness than our shop capacity has hitherto allowed us to do.

Amor & Thompson (Lathes, etc.), 168 Centre Street, New York, write us:

We have increased our business considerably during 1881, adding about one-fourth more machinery, prices realized on our productions being a little in advance of previous years. At the same time, labor and material were correspondingly higher. Our prospects, orders, etc., for 1882, are encouraging, no lack of business or indications of the same being perceptible at present.

E. W. Bliss (Presses, Dies, etc.), Plymouth, Pearl and John Streets, Brooklyn, N. Y., writes us:

My business for the closing year has been most satisfactory, and in amount far in excess of 1880, which, in its turn, largely exceeded any previous year. At the opening of the year I made what I considered a liberal provision to meet the probable increased demand for my machinery and tools. This, however, proved to be entirely inadequate, and, in order to meet the demands of my customers, a considerable addition to my machinery became necessary. As it was impossible to procure suitable machines by purchase in time to serve my purposes, I was compelled to get up the patterns for an engine lathe, and build six for my own use, and have since started on five more, which will be needed as soon as they can be finished. I shall then probably continue to build them as a part of my regular line of manufacture. During the year new processes have been developed, and new machines have been brought out for working sheet metal, which are being received by the manufacturers with great favor. I have added a new building to my factory, to be used as pattern shop, etc.; have put in an additional steam boiler, and am in good shape to handle the business of the coming year, the prospects for which are very promising.

The Fitchburg Steam Engine Co., Fitchburg, Mass., write us:

Our report is much the same as last year. We have had no let-up in our business, having our full force of about 50 hands kept full of work, ten hours a day, for six days in the week, and at times until ten o'clock in the evening.

If we had more tools we could easily obtain more work, as we cannot satisfy many would-be customers on time. The demand has been for larger engines, and we have added three sizes of patterns for large horizontals the past year.

Have also added some new tools. Our outlook into the coming year is as cheering as we could wish. Through the "hard times" cheapness in machinery seemed a desideratum, but now first-class work "holds the fort," and meets ready sale.

The E. Horton & Son Co., Windsor Locks, Conn., write us:

The demand for the Horton Lathe Chuck is constantly increasing; we have doubled our facilities for turning out work in the past year, and are still behind our orders. We are having more special machinery built at present, which we expect, when started, will enable us to keep up. The prospects for the coming year are all that we could ask for, and we see indications that the demand for our chucks will be greater than in the past.

The Valley Machine Co. (Steam Pumps), Easthampton, Mass., write us:

We are just closing the best year for business that we have ever known since our concern started in 1867. The greatest trouble we have experienced the past year was in obtaining skilled workmen. Such men who were sober and industrious could find employment without leaving home to look for it. We are paying from 15 to 20 per cent. higher wages than we were last year. We shall increase our machinery the coming year, and shall adopt a system of taking apprentices, as we find the best way to get good men is to educate them ourselves. We can foresee no reason now why we shall not be busy the coming year.

Kearney & Foot (Files), 101 Chambers St., New York, write us:

The past year has been a very busy and satisfactory one to us. While largely increasing our production, we have been unable to catch up with orders, and this month have delivered goods on orders taken just a year ago. Prices have held firm, though at present there is a tendency to lower quotations. We now employ about one hundred hands, and it is our future intention to build additions to our present works on or about July 1st, 1882, which will double our present capacity, and we hope enable us to meet the wants of our customers much more promptly.

The John H. McGowan Co., 134 W. Second St., Cincinnati, Ohio, write us:

The increase of our trade during 1881 has been far beyond our expectations. We added a brick building, 5 stories, 88 feet front by 110 ft. deep to our already large works, last May, and are filling it with machinery as fast as we can get it made. We have quite a large number of lathes on order now, and hope to get them soon to help us out of our rush. Our prospects for 1882 are exceedingly good. We have some large contracts on hand for our "Rival" Steam Pumps for feeding portable and traction-engine boilers, and have good prospects of securing several others. We are also largely engaged in manufacturing machinery for the manufacture of *plug tobacco*, and have made several large shipments to New Zealand, Australia and Hamburg, Germany.

Prices remain about the same as a year ago, although we are paying a little more for both iron and labor; but the present prices leave us a fair profit, which is all we ask.

W. P. Davis, North Bloomfield, N. Y., writes us:

For two months the demand for my Drill Presses and Key-Seat Machines has steadily increased, until, at the present time, I am obliged to run night and day to fill orders, especially on key-seat machines, which seem to be a much-needed tool. Am receiving orders from all parts of the United States and Canada. So many manufacturers place so much labor, not essential to the well-working of machines, on many of the tools that they make, that it brings prices beyond the reach of many users. I find a machine that works well, is strong and durable, easy to manage and quick to adjust, at a moderate price, is what the careful buyer is seeking for. The many orders I am receiving satisfy me that I am right. I can see no reason for the falling off in business that is predicted by many, as an over production in general machinery cannot be brought about in a long time. I will here say I get as many sales from your paper as any two other papers that I advertise in.

E. Gould & Eberhardt (machine tools), Newark, New Jersey, write us:

The year 1881 opened with our hands full of orders, and has kept on that way all the way through. We have been compelled to increase our facilities, and to work ourselves and our hands overtime all we could stand, to satisfy our customers. We have kept on improving our tools, and our customers have followed in duplicating their orders. Prices of material and labor have advanced, and new tools accordingly, and it has been met willingly by the market. The outlook for 1882 is as promising as 1881.

Betts Machine Company, Wilmington, Del., write us:

Our machine tool business has been in a very satisfactory condition the whole year and still continues, so that you will see we have no cause to find fault with it, even if we were disposed to do so. Our order book is well stocked with orders and at fair prices. Our foundry, machine shop and boiler house have all had additions made to them during the past year, and further improvements are in contemplation as soon as the spring opens. Our operations are a little embarrassed, owing to the scarcity of strictly first-class labor. Business in our gauge department is considerably more than double what it was in 1880, and we feel greatly encouraged with the interest manifested in this very important matter, both at home and abroad.

Pedrick & Ayer (successors to The L. B. Flanders Machine Works), 1,025 Hamilton St., Philadelphia, write us:

Business for the past year has been unusually good. The demand for our "Special Tools for Railway Repair Shops" has increased very materially. New tools have been added, our working force increased, and we are now considerably behind in our orders. The outlook for 1882 is very bright. We have made some improvements in our specialties, and added new ones to the list. Our Portable Cylinder Boring Machines have been in constant use for a long time, both in and out of the city, and many sales have been made of the same in this country and others.

Bradley & Co., Syracuse, N. Y., write us:

Our anticipations of a year ago regarding the demand for our Cushioned Helve Hammers have been more than realized, as the sales have far exceeded our expectations. Although we are working nearly 200 men, and have been running nights for months past, we are still largely behind our orders. Besides this, the increased consumption of our agricultural implements has compelled us to increase our manufacturing facilities, by adding to our works a four-story brick building 80 × 175 feet, which is now nearly completed. All indications point to a largely increased trade for the coming season, with a much better general outlook for manufacturers.

The New Haven Manufacturing Company (Machine Tools), New Haven, Conn., write us:

We have found a ready market, at fair prices, for our productions through the year, and the outlook for 1882 seems very favorable. We have made some important additions to our works, which will enable us to increase our manufactures. We have not advanced our prices materially during the year, although the gradual, but steady increase in the cost of material and labor, together with the constant improvements we are making to our tools, have added largely to their cost.

Backus Water Motor Company, Newark, N. J., writes us:

Our business has increased about three-fold last year, and our prospects for trade never were better than at this time. We have opened a branch in Chicago, from which to handle our Western trade, have enlarged our factory room, and shall probably have to increase it the coming year.

The Morse Twist, Drill and Machine Company, New Bedford, Mass., write us:

We have been favored with an increased business during the year so nearly closed, and have found need to add quite considerably to our facilities for manufacture. The coming year seems to promise well for continued activity.

Skinner & Wood (Engines and Boilers), Erie, Pa., write us:

The season just closed has been a prosperous one, though not altogether satisfactory. The high prices asked for labor and tools, and the difficulty in procuring prompt supplies, has proved annoying during the summer, and made business less remunerative than usual. We anticipate no marked change in prices for the coming season, though a small advance would be reasonable. Our capacity will remain unchanged, and we shall undertake no enlargements in buildings.

G. A. Gray, Jr. & Co., 17 East Eighth St., Cincinnati, Ohio, write us:

We started the manufacture of 19-inch lathes last February, with the determination of making a perfect tool at a moderate price. We spent about one-half the time between that date and this in getting ready, making special tools, fixtures, etc. We have, since that time, turned out 40 lathes with beds varying from 6 ft. to 12 ft., and have orders now for half as many more. We are fixing to turn out 100 lathes of this size next year, besides a larger size, which we will have ready soon.

A. M. Powell & Co., successors to Wight & Powell (Iron Working Machinery), Worcester, Mass., write us:

We are extremely busy at this time, working all the force we can accommodate, and still are behind our orders. We have not half shop room enough, although when we moved into our present quarters last July we thought that this shop would certainly last us a number of years. Desirable shop room is not to be had in Worcester, and if our prospects remain good we shall probably build a shop in the spring or summer.

(We have received several more letters from manufacturers, which for want of space we are unable to present this week. They will appear in our next issue.)

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☞ *Every correspondent, in order to insure attention should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers can have the mailing address of their paper changed as often as they desire. Send both old and new addresses. Those who fail to receive their papers promptly will please notify us at once.*

NEW YORK, JANUARY 21, 1882.

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The printed date on each wrapper shows the time to which the subscription is paid. We discontinue the paper in all cases when the time paid for has expired, unless renewed.

The Machinery Prospects for 1882.

We present this week a number of special letters from machinery, tools and appliances throughout the country, outlining the present condition of business in each establishment, progress during 1881 and prospects for 1882.

One year ago we published a collection of letters of the same kind, which gave expression to business prosperity and confidence in its continuance during the ensuing year. That, then, confidence was not misplaced is made evident by a perusal of the letters published on the 6th and 7th pages of our present issue, which confirm, with particulars in each case, the oft-repeated reports of unexampled prosperity in the machinery business. It will be noticed that there is scarcely an exception in those letters to the general mechanical progress and business success; almost all speak of the high tide of prosperity, and every expression as to the future is one of confidence in the continuance of the present condition of business during the year 1882.

A most gratifying feature of our mechanical industries may be seen in the advancing of mechanics' wages—one of the largest establishments noting an average increase during the past year of fifteen per cent. When skilled workmen can everywhere command steady work and good wages, the mainspring of our unexampled business activity and consequent prosperity is sound and in good working order. Enlargements of shops and increase of force and machinery have been the rule for a year past. The machine-tool builders are apprehensive that orders will continue to keep ahead of production for months to come. Engine builders are also pressed to deliver their motors at the time wanted by purchasers, and steam-pump manufacturers are enlarging their facilities to meet the increasing demand. Taken altogether, the outlook for machinery business this year is about as good as could be wished for.

Results of the Atlanta Exposition.

The International Cotton Exposition at Atlanta, which closed December 31st, has been productive of results very gratifying not only to its projectors but to every class of people in industrial pursuits, both North and South. The fair was well attended from the outset, and towards its close the crowds increased from day to day. One excellent result is a better acquaintance of the manufacturers of the North with the manufacturers and agriculturists of the South. A great deal of prejudice and acrimonious feeling has thereby been obliterated. The rich opportunities for establishing productive enterprises in the South by the aid of Northern capital, have been examined and many of them will be taken advantage of in the near future. It is related upon good authority that over fifty Northern concerns will establish branch manufactories and salesrooms in Atlanta, as a direct consequence of becoming acquainted with the business opportunities in the South, through the Exposition.

A better opinion of Southern mechanical productions has been disseminated throughout other sections of our country by visitors returning from Atlanta. It was our privilege to spend a portion of the last week at the Exposition, and to observe about all the mechanical exhibits. In some departments, especially in that of cotton gins, Southern manufactures seemed to take the lead and receive the most favorable notice. We are informed that many exhibitors of machinery and tools had made large sales to Southern customers at the fair. The exhibitors generally, so far as we can learn, are well pleased with the results of their displays, many of them wishing for more expositions of the same kind. Universal exhibitions seldom if ever pay expenses directly, but the one held at Atlanta shows but a small deficiency in receipts as compared with expenditures, which, in view of the benefits derived, will gladly be made up. When the fact is taken into account that the body of visitors had to travel hundreds of miles to reach the fair, and that Atlanta is not a large commercial center likely to be visited by crowds of people for any other purpose than to see a great exhibition, it is remarkable that the financial results are so favorable. An exhibition of like character in one of our largest cities would probably yield a handsome profit. Some hundreds of premiums were awarded, which will be preserved as mementoes of the Cotton Exposition of 1881, and the end has crowned the work.

The Water Supply of Cities and Large Towns.

Looked at as a matter of interest to the mechanic and manufacturer, there is no question of greater importance than the quality and quantity of the water supply of our large towns and cities. As a necessity, the manufacturer requires, ordinarily, a considerable supply for industrial purposes, and it is almost imperative that for this supply he shall not be heavily taxed, while the mechanic and working man are individually large consumers, and it is of vital importance to them that the quality of the supply shall be good. All medical science—and common sense, as well—agrees that no single thing exerts a greater influence on the health of a people than the quantity and the quality of the water they use; and the moralist, without fear of contradiction, might go further, and show that the water supply of large cities had as much to do with the morals of its inhabitants as any other single thing. It is well known that in thickly populated districts, even were it possible to obtain any part of this supply from wells, it would be totally unfit for domestic purposes, so that, in this respect, dependence must be placed entirely upon the organized means.

It is a curious commentary on the lack of ordinary precautions in this respect, that water so poor in quality is, in many instances, furnished, amongst others, for drinking and culinary purposes, as to seriously interfere with manufacturing interests, the cause for which may, in the majority of instances, be found in the desire to save a few dollars that would have been expended in going a little further for the supply.

The past summer and part of the fall were, in many parts of the country, exceptionally dry; but there is no reason why other seasons, as exceptional in this respect, may not be expected, and, in view of the fact that in some of our large towns and cities epidemics have prevailed, which were directly traceable to the impurity of the water, it would seem that whatever was behind in the way of a cause for this would be removed at once.

In at least one instance, last summer, the inhabitants of a large town in this State were instructed by the authorities to refrain from using the water in the service pipes, after its use had induced wide-spread sickness. The authorities failed, however, so far as known, to instruct them what to use as a substitute.

In many instances qualitative analyses are submitted, for the purpose of demonstrating that water impregnated with the sewage and impurities of large towns and cities is harmless, when, perhaps, by a slight addition to the expense incurred, the whole matter might have been placed outside discussion by going beyond the disturbing cause for the supply.

In the majority of instances, where trouble has been experienced the past season from poor water and an insufficient supply, it will be repeated. That trouble is haply passed, and mankind, if they learn by experience, are slow to do so. But this question will have a greater influence on the manufacturing interests of localities in the future than it has had in the past. The workingmen—those of the population who cannot spend the unhealthy season away from town—are vitally interested in the subject, and a better understanding of sanitary requirements, which is coming with the rapid spread of knowledge, will lead the more intelligent to shun those places where they are not decently provided for in this respect. Already, and beyond question, this has more influence in determining the character of this class of the population of different localities than is willingly admitted, and as the laws of health and decency become better understood, this influence will be extended. In the near future, where good workmen can live comfortably, the best manufactories will be established; and especially for the workingman and his family, there can be no comfort without an abundant supply of good water.

But the subject presents another aspect, in which the manufacturer is particularly interested, and that is with reference to the means for dealing with extensive fires. In this respect, but few of our large cities, as has been in many instances demonstrated in a very costly manner, are suitably provided—sometimes the lack being in the total supply, but oftener in the distribution. In many instances districts are traversed by laterals that were ample at one time, but which the increase of population have rendered entirely inadequate in the case of fire, and, somehow, this is never found out until after a destructive fire, nor always remedied even then. A few examples of this kind lead manufacturers to locate elsewhere.

On the whole, in no single thing involving such serious consequences to life and property, are so many mistakes made as in supplying our cities with that which covers the larger part of the earth's surface. Gravity plans are found to be failures, because of going in the wrong direction for the supply, and the failures are not infrequently made more conspicuous by building additional costly reservoirs to store water that never comes. In the city of New York, which came so near a costly experience the past season, many impracticable schemes have been advocated, such as laying additional mains and erecting costly machinery to pump salt water, but no one seems to see clearly the absolute necessity of going in some direction for an ample supply of pure water.

After the fire of last summer, which came so near being disastrous, the citizens were told on good authority, that many of the laterals in the city would be found quite too small in the event of an extensive conflagration, but we have heard nothing of their being replaced by larger ones. In this and in other respects as to quantity and quality of water supply, New York is no worse—not so bad, perhaps, as many other cities, scarcely one of which seems to have any adequate idea of the sanitary, manufacturing, commercial and moral advantages, of an abundant supply of good water.

The article on our first page, entitled "Use of Standard Gauges in Shops," by A. H. Emery, designer and builder of the great U. S. Government testing machine, will be read with special interest. In the construction of that machine, particularly, Mr. Emery experienced the real value of such gauges, and wishes to impart some of the knowledge he has acquired by experience to others in the machinery line.

Another of Prof. Sweet's admirable articles on Mechanical Drawing appears in this issue. Each one is widely read and profited by.

Evils of Prison Contract System.

The object of State prisons, we are taught to believe, is to reform, or in other words, to take bad men and make them better. If confinement in the State prison fails in this, it is very apparent that there is something wrong in its management.

Under the present system of contract labor in prisons (New York State in particular), we are persuaded that there is little or no influence brought to bear upon the prisoner to make him resolve to lead an honest, upright life, but on the contrary, the treatment received has a tendency to lower him nearer the animal than to elevate him to the highest standard of citizenship. As the present contractors manage convict labor, society is burdened with an evil more pernicious than slavery, as it formerly existed in this country, for the reason that manufactured goods produced in the prisons are placed upon the market at such low rates, as in dull seasons to drive out or kill the demand for a better class of goods, the products of honest labor.

It is, therefore, obvious that great harm is done to free labor, in consequence of the low price at which convict labor is secured.

It is also quite plain that the contractor who hires stout healthy men at the small compensation of forty or forty-two cents a day, can by the infliction of punishments and tortures, which belong to the old-time Inquisition, wring from his men the greatest possible amount of work. This gives him an unfair and unjust advantage over other manufacturers who are compelled to hire honest men and pay them living prices for their labor. In order to compete with the prison contractors, outside manufacturers are compelled to cut down the pay of their men to rediculously low figures in order to sell their products. Take, for instance, the State of New Jersey, where the manufacture of hats in the State prison was carried on to such an extent and prices cut so low as to reduce honest workmen to want.

They combined their influence and presented their case so strongly to the Legislature that the manufacture of hats in the prison was stopped. Since that time there has been a healthy competition in the manufacture of hats. It must be borne in mind that the prison contract system defies competition, as it is impossible for other manufacturers to fairly compete with such labor.

Efforts have been made in the New York Legislature to secure, not only for hatters, but others as well, a similar protection against this evil, to that obtained in New Jersey, but the contractors were too strong for those in favor of the bill. By loading down the bill with amendments, those endeavoring to push it through became discouraged and the bill failed to pass.

The hat contractor in Clinton Prison is said to employ 450 men.

It may readily be seen that, under the contract system, everything in the management of the prison must be made to bend to favor that system.

The stove contractors of Sing Sing Prison, who had a lease of convict labor, which would have expired this year, have had their contract extended five years, which will continue it beyond the term of office of the Superintendent of Prisons.

When the contractors can get pattern moulders, core moulders and machine moulders for fifty cents a day, whose services are worth to them $4 a day, who will dare to say that all free moulders in the stove business are uninjured?

The work, as a rule, is inferior, and is not of a uniform quality; but many consumers desire to buy cheap, and are not always judges of good mechanical work.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(21) G. A. S., Springfield, Mass., asks how he can soften bone so that it can be worked into pistol handles, and become hard afterwards? *A.*—We know of no satisfactory way to do this.

(22) H. G. M., Boston, Mass., asks: Do you know of an engine fly wheel, over 10 feet in diameter, used as a driving pulley, which has its face covered with leather on which the driving belt runs? *A.*—We have never seen such a pulley as you refer to covered with leather. We presume, however, that some of our readers may be able to cite you an instance.

(23) B. H., Harlan, Iowa, asks: What would the patent of a valve motion be worth, with which the engine could be reversed and only one eccentric used? *A.*—There is nothing new in the idea of reversing an engine having but one eccentric. Unless you have made some decided improvements in the arrangement of parts, the patent would probably have no commercial value.

(24) W. F., New York, asks: 1. In dynamo-electric machines does the current pass through the coils of the magnet? *A.*—Yes. 2. Can you give a description of a dynamo-electric machine large enough for 8 candle power? *A.*—We could not give a description of such a machine that would be of any practical value, without cuts and matter that would take up more space than the subject would warrant.

(25) B. F. C., Philadelphia, Pa., asks: 1. How can I coil tempered steel wire 1-32″ in diameter on a mandrel 3-32″ diameter? *A.*—If, as we infer, you ask how to coil wire in the manner stated, that is already of spring temper, we know of no way to do it. 2. How can I make a spiral spring long enough to use an entire coil of wire. *A.*—You can wind a spring as long as the mandrel on which you wind it, but if of great length you would have to make special provision for holding the mandrel, such for instance, as a hollow tail and head stock spindle.

(26) I. L. M., Courtland, N. Y., asks: 1. What should be the proportion of steam and exhaust pipes to area of cylinder of a steam engine? *A.*—This depends on the piston speed. For a speed of 500 to 600 feet per minute an area of steam pipe equal to 1-10, and of exhaust pipe equal to 1-8 the area of the cylinder gives good results. 2. What is the best preparation for tempering steel milling cutters? *A.*—We question if there is anything better than pure water. If the cutters are quite light, let the water be of about 90° temperature.

(27) J. C. B., Denver, Col., sends three sketches of methods of placing tubes in a boiler. In the first sketch the tubes are shown placed in horizontal rows, in the second they are placed in horizontal and vertical rows, and in the third they are placed in vertical rows. He asks: which of these methods is the most in use, and what are the arguments for and against? *A.*—The tubes placed horizontally as in the first example offer the most obstruction to the escape of steam to the surface of the water; hence this method is generally discarded. The tubes placed in rows both ways—horizontally and vertically—offer the least resistance to the escape of steam to the surface, and also permit a view of the lower surface of the shell between each row of tubes; hence it is probably more generally used than either of the other plans. The third plan, in which the tubes are placed in vertical rows, is by some engineers preferred to either of the others, as admitting of getting more tubes in the boiler with less weakening of the head than in the second plan. It affords a better chance for the steam to get to the surface than in the first plan, but not so good as in the second plan.

(28) J. M. C., Scammonville, Kan., writes: Please give me answers to the following questions: 1. What should be the stroke and diameter of the cylinders of a steam engine (two cylinders), to hoist a load of 40,000 pounds up a slope of 650 feet in length, and having a rise of 125 feet; running time to be one minute; piston speed, 250 feet; average steam pressure on piston 40 pounds per square inch, and diameter of drum 15 feet. The connecting rods to be attached directly to the drum? *A.* You do not state the manner in which you are to move the weight, upon which the friction would largely depend. We shall, however, assume that the loss will add 25 per cent. to the power required, and to simplify the calculation will assume it to be added directly to the load, making $40{,}000+(40{,}000\times.25)=50{,}000$ pounds. The drum will wind up, say, 47.5 feet of rope or chain at each revolution: Hence $650\div47.5=13.61$, say 14 revolutions will move the weight the entire distance. As your engine is to run at 250 feet piston speed, and make the same number of revolutions as the drum, it follows that: $250\div14=17.7$, say 18 feet of piston travel must be had for each revolution of the engine, so that $18\div2=9$ feet, the stroke of the engine. You have, according to the terms, 50,000 to raise 125 feet high in one minute, hence you will require $\frac{50{,}000\times125}{33{,}000}=189+$ horse power, which you had better, for prudential reasons, call 200 horse power, or 100 horse power from each cylinder. Your piston speed is to be 250 feet, and mean effective pressure 40 pounds, and every inch area of piston would amount to $\frac{250\times1''\times40}{33{,}000}=0.3$ horse power. To get 100 horse power, each cylinder must have an area of $100\div0.3=333$ inches, corresponding to a diameter of say 20¾″. This would make the cylinders of the hoisting engine 20¾″×9 feet and even then you would be obliged to have considerable flywheel to work successfully. 2. What should be the dimensions of engines with a drum 12 feet in diameter? *A.* A 12-foot drum would wind, say, 37 feet of chain at each revolution, hence 47.5 : 37 : : 9 : 7.2+feet, or a stroke of, say 7 feet 3″, with same diameter as in previous example. 3. What should be the dimensions with a 10-foot drum? *A.* A 10-foot drum would wind, say 32 feet of chain to a revolution hence: 47.5 : 32 : : 9 : 6+, or say a stroke of 6 feet 3″, with same diameter. In either of the above instances it would not be safe to calculate to do the work satisfactorily with cylinders of less than 23″ in diameter. 4. What should be the dimension of cylinder in above case, with engine geared 4 to 1, and running 300 feet piston speed? *A.* By "above case" we suppose you mean with a 10-foot drum, and making the 650 feet in one minute. A 10-foot drum will make $650\div32=20+$, say 20.5 revolutions in one minute, and the engines will make $20.5\times4=82$ revolutions in the same time, hence the piston speed, 300 feet divided by the number of revolutions, 82, equals the travel per revolution, which divided by 2, equals the stroke of engine, thus $\frac{(300\div82)}{2}=1.83$ feet, or say 22″. At a piston speed of 300 feet, each inch area of piston equals $\frac{300\times1\times40}{33{,}000}=$ 0.36 horse power, so that the area of cylinder would be $100\div0.36=277''$, corresponding to a diameter of about 18¾″, which should be increased for safety to 21″, making the cylinders 21″×22″.

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The publishers of the Engineering and Mining Journal will issue January 4, 1882, and each Wednesday thereafter. COAL, a weekly journal, to be devoted exclusively to the interests of the coal trade, including: 1. The mining and preparation of coal for market. 2. Its transportation. 3. The marketing of coal. 4. The economical use of coal. COAL will be profusely illustrated, and the freight, labor and wages questions will be treated in a thorough and popular manner. The statistical information of COAL will be collected with great labor and care, and will give the current production of coal throughout the country. COAL will be conducted by gentlemen of ability and great experience in every department of the coal trade, and will have, at the outset, a large staff of reliable correspondents at the different coal centers of the country. Subscription price, $2 per year. Specimen copies on application. Address The Scientific Publishing Company, 27 Park Place, New York. P. O. Box 1833.

Ealy's "Blue Book"—Credits of the machinery, hardware, implement and metal trades. Published semi-annually by the National Hardware and Stove Association, 51 Chambers Street, New York, and 79 Dearborn street, Chicago; John W. Ealy, General Manager. This book contains information regarding the capital and pay ratings of over 60,000 dealers and manufacturers, together with a classified list of all manufacturers, wholesale and retail dealers in hardware, iron, machinery, agricultural implements; railway, machinists', engineers' and boiler makers' supplies, brass goods, plumbers, and dealers in plumber's supplies; stoves, tin, cutlery, guns, and the users of iron and metals generally. This reference list has heretofore been confined exclusively to the hardware and metal trades; the machinery trades have been recently added to the long-established features already existing. Furnishing detailed written reports to subscribers of the condition and paying qualities of any dealer is an important feature of the system. Published January and July. Price, $75 for two books, written reports, etc. Address John W. Ealy, General Manager, 51 Chambers Street, New York.

MANUFACTURES.

The Atlas Engine Works sold eight engines by their exhibit at the Atlanta Exposition.

The Troy Globe Valve Company, Troy, N. Y., are adding tools and help. They have work ahead for five months.

The Maine Corn-Husking Machine Company has been organized at Portland, with a capital of $25,000.

The Baldwin Locomotive Works have orders on hand sufficient to run the shops full blast for eighteen months.

A citizen of Duxbury, Mass., offers an acre of land and $50 to any party who will build a shoe factory near the South Depot, and employ not less than fifty hands.

Twenty new carpet mills of large proportions have been erected chiefly in the upper part of Kensington, northeastern part of Philadelphia, since January 1st, 1880.

Frank H. Pond, machinery supplies, 707 and 709 Market Street, St. Louis, Missouri, has established a branch office at 130 West Second Street, Cincinnati, Ohio.

A Texas company has been organized at Marshall, with a capital stock of $50,000, for the manufacture of cotton gins, farm machinery and agricultural implements.

The Boston *Bulletin* says that Whitely, Foster & Kelley, of the Champion Mower and Reaper Works, Springfield, Ohio, contemplate erecting a Bessemer steel works and rolling mill for their exclusive use.

D. Giles & Co., Chattanooga, Tenn., iron founders, have applied for a charter of incorporation. Capital is to be increased, and an addition built to the foundry to accommodate another crane and trip.

It is reported that R. B. Dunn, of Waterville, Me., will erect a cotton mill in West Waterville the coming season. If the town will make concession by the nominal taxation, he will erect a mill of 30,000 spindles.

The Rhode Island Locomotive Works, at Providence, have received orders for the construction of ten new extra-fast locomotives for the Grand Trunk Railway, in addition to the new first-class passenger coaches in course of construction for the same company.

The Pratt & Whitney Company, Hartford, are filling an order of $50,000 worth of tools for sewing machine manufacture for the Union Manufacturing Company, of Toledo, Ohio, a company with a capital of $300,000, that will start operations about April 1, 1882, with 300 hands, in new buildings, 200x40 feet, three stories, and an L of 80x40 feet, using 200 horse power of steam.

Smith, Myers & Schnier is a new firm just starting shops at 323 to 329 W. Front Street, Cincinnati, Ohio, for the manufacture of steam engines, saw mills and machinery of all kinds. The members composing the firm (Sam'l R. Smith, Edward Myers and Anthony Schnier) have withdrawn from the Lane & Bodley Co., with whom they have been associated for the last twenty-five years, for the purpose of starting this new establishment.

Charles Kaestner & Co. have removed to their new establishment at the southwest corner of Canal and Harrison Streets, Chicago, a structure formerly occupied by the American Steam Engine Works. The building has been remodeled, and is two stories in height, 100x170 feet, with a large yard 50x100 feet. A quantity of new and improved machinery has been added to the works, and employment will be given to 75 men.—*Industrial World.*

The Atlas Engine Works, Indianapolis, Ind., have received recent orders as follows: The Chicago Lumber Co., a 26″x60″ automatic engine, with a 14-ton band wheel for a 36″ belt; also four boilers, five feet diameter and 16 feet long, together with all appliances of a complete steam outfit; and the New Orleans Wharf Co., a 125-horse power automatic engine for the electric lighting of their wharves. They have just shipped two large locomotive boilers to Palestine, Texas, for the new water works being erected there.

On December 24th, Henry R. Brown, general foreman of the machine shops of the Hartford Engineering Co., was presented with a fine gold watch and chain by the workmen under him. The response of Mr. Brown to the presentation, made under all the embarrassments that usually attend such occasions, was just what all who know the man would expect—straightforward, manly and full of sense. The gift was a generous token of respect to a man who well deserves it. Taken altogether, it would be difficult to tell who received the most pleasure, the men who gave or the man who received.

Mr. A. W. Danforth, of Lowell, Mass., who has been in Shanghai looking over the ground for a new cotton mill, which he is to build and run for a Chinese company, arrived home a few days since. He has been in the Flowery Kingdom two months, and has carefully examined several lots which have been offered as sites for the mill. He has now gone to the Atlanta exposition to make a critical study of the cotton manufacturing machinery in operation there, in order to select the best for the Mongolian enterprise. Before returning to China he will place orders for a complete outfit for the mill, which will be built on his return in the spring. It will be of brick and either two or three stories high, depending upon the site selected.

The increase of activity in the various industries of the country engaged in the working of wood and metal, has necessarily given rise to an increased demand for files, and has kept our largest concerns running at their fullest capacity. The smaller shops, largely employed in re-cutting, are also reported to have had a busy year. The prices obtained during the year 1881 will not average better than those of 1880, notwithstanding the slight advance realized since the adoption of the new price list in July last, owing to the higher figures ruling in the early part of 1880, and the enhanced cost of steel and supplies during the past year. Most of the factories are full of orders, which, at this season of the year, is unusual, and the output for 1882 promises to be very large, as a consequence of the demand for goods, and should result in prices being well maintained, if not appreciably advanced.

The Hartford Steam Boiler Inspection and Insurance Company has had a successful year. The number of boilers under its care is nearly 14,000. It employs constantly thirty inspectors, all men of experience. It has added to its other departments that of qualitative chemistry, with a view to overcoming the many difficulties to which boilers are liable from bad water. It prepares plans for boilers, boiler settings and chimnies for its patrons, and this feature of its business seems to meet with much favor. It has been liberal in a judicious expenditure of money in experiments bearing directly on its business, putting forth no foolish theories, but basing all its suggestions upon actual experience. Having had an active experience of fourteen years, its recommendations are entitled to careful consideration.

Machinists' and Engineers' Supplies.

NEW YORK, Jan. 5, 1881.

Most of the dealers are engaged in taking an account of stock, but the demand for supplies has not suffered perceptibly. The amount of business transacted during the week has been unusually large for the first week of the new year. Prices still tend upward.

Iron and Metal Review.

The demand for Pig Iron is active, and, at present, rather in excess of the supply. The supposition is that prices will advance considerably during the next few weeks: prices, however, during the past week have not advanced.

We continue to quote foundry No. 1 at $26.50 to $27; Foundry No. 2 X at $24 50 to $25; Gray Forge, $24. The Foreign Iron market has been cleaned out during the past week, and new arrivals are anxiously looked for. We quote Gartsherrie at $26; Coltness, $26.50 to $27; Glengarnock, $25.50; Carnbroe, $25; Eglinton, $25. Steel, Iron and Old Rails unchanged. Prime Wrought Iron Scrap in demand at $32 50. Merchants' Bar Iron in active demand. Present card rate adopted by manufacturers, 2½c.

The demand for copper is fair at 20½c. for Lake Superior. Straits Tin, 24½c. to 25c. Australian and Billiton the same. Lead, 5¼c. to 5¼c.; Spelter. Western, 6c. Antimony 14¼c. to 14½c. for Cookson, and 13c. for American.

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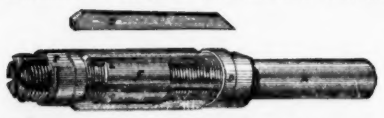

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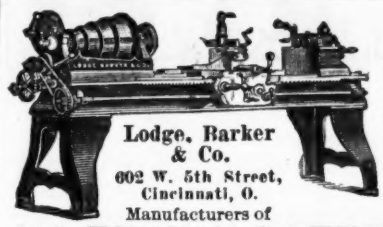

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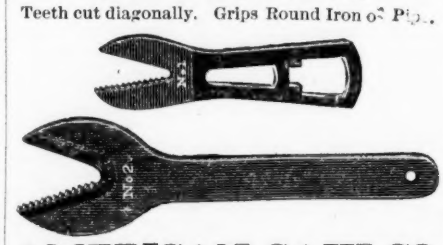

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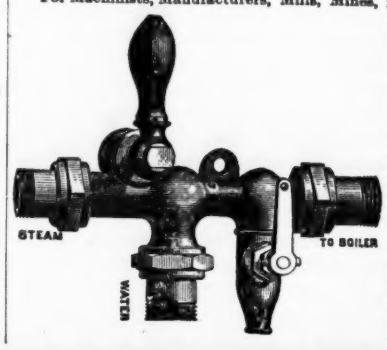

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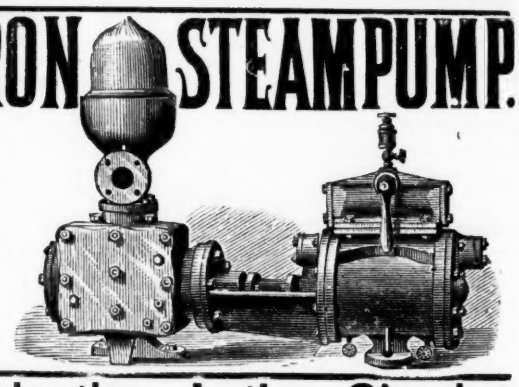

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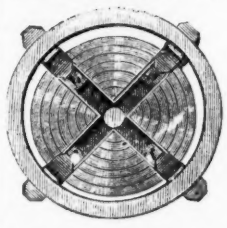

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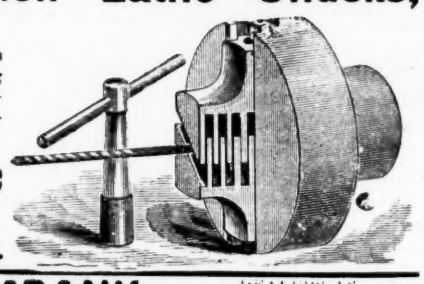

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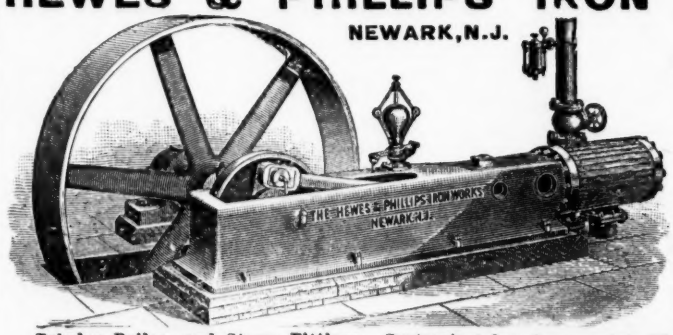

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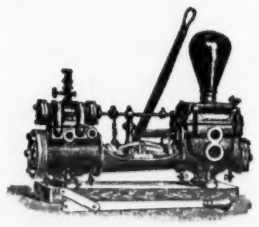

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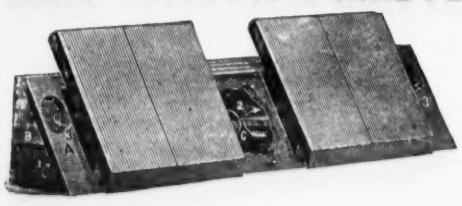

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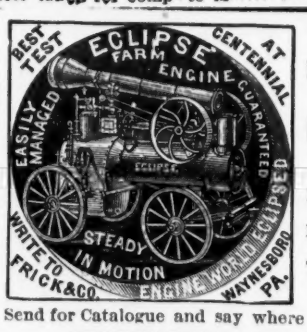

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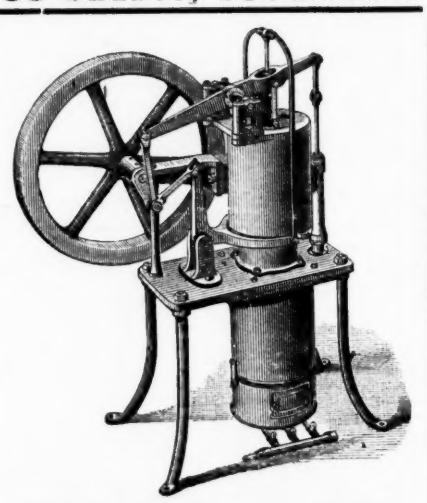

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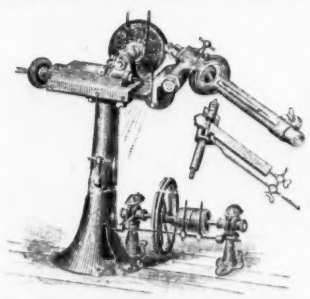

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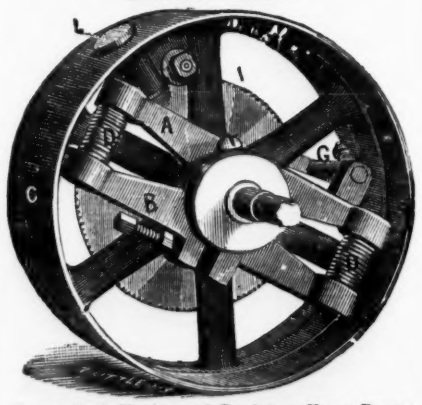

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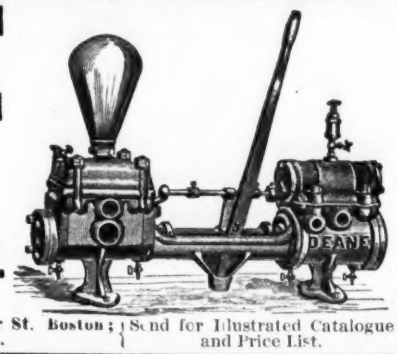

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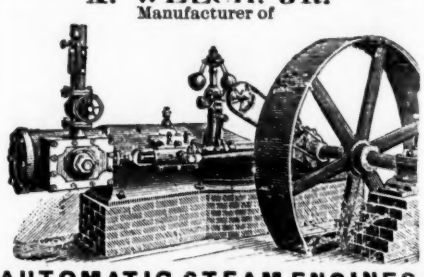

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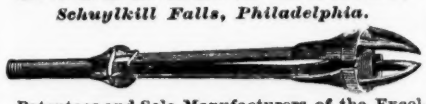

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" 10	1 1-2 "	1.10
" 11	1 3-4 "	1.25
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" 13	2 1-4 "	1.60
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Full set, 19 Dogs,		26.35
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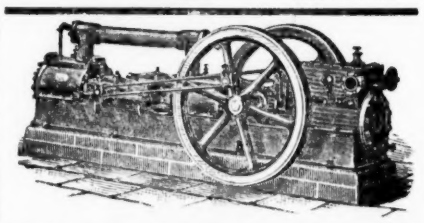

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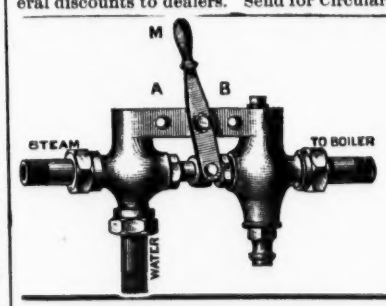

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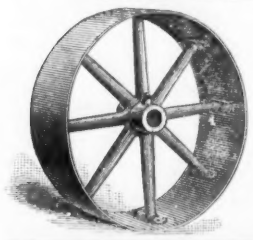

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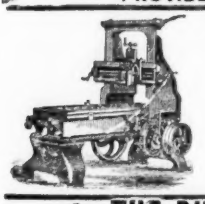

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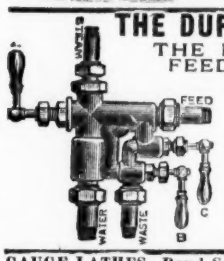

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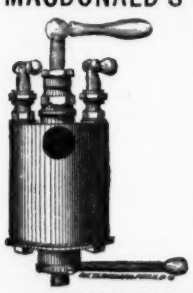

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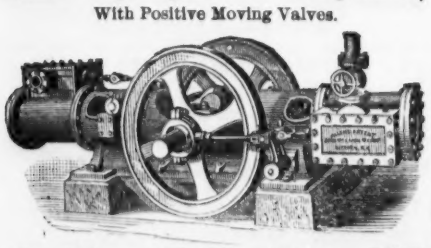

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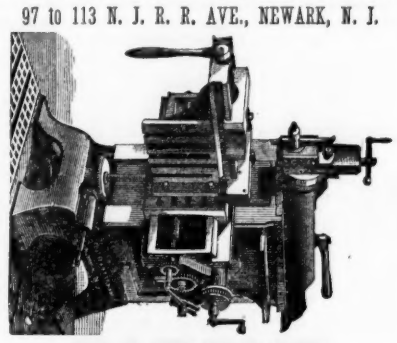

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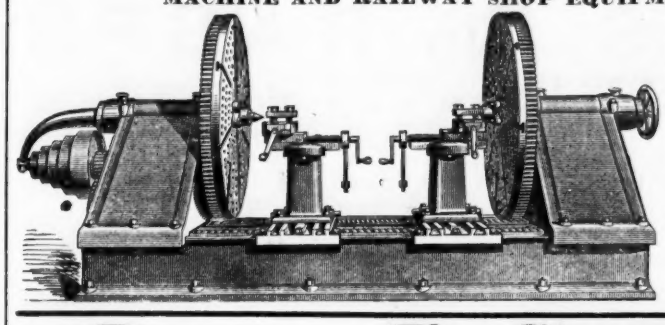

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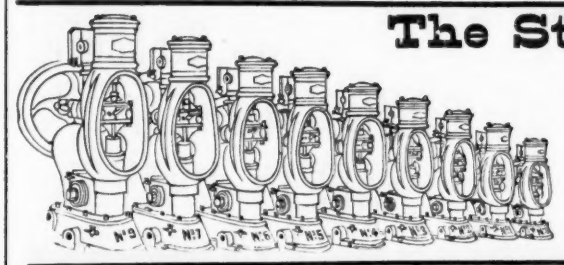

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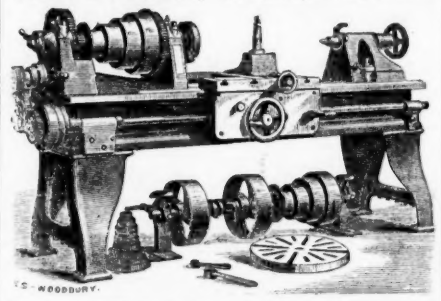

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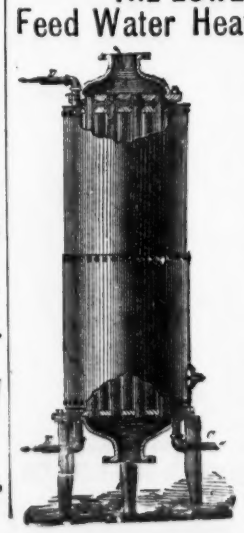

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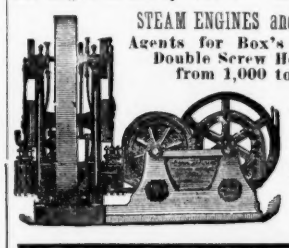

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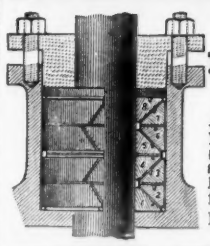

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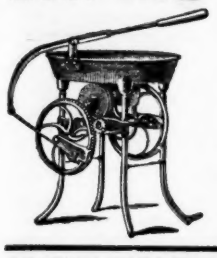

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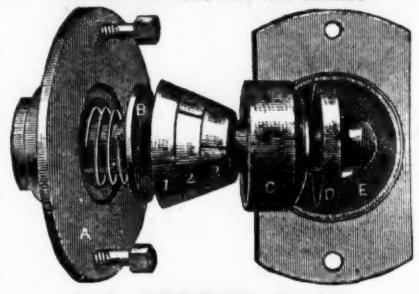

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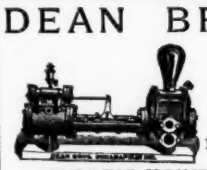

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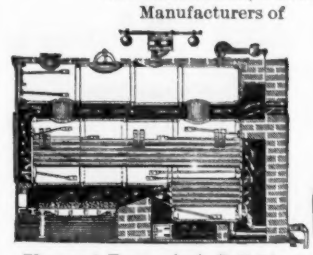

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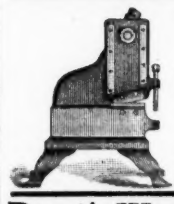

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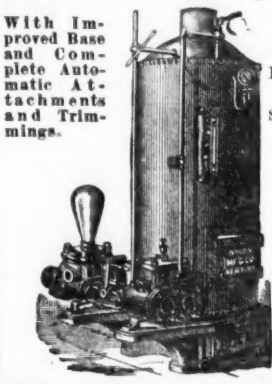

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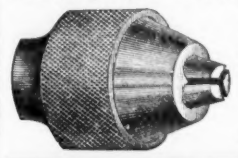

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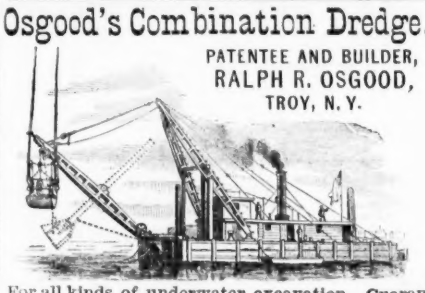

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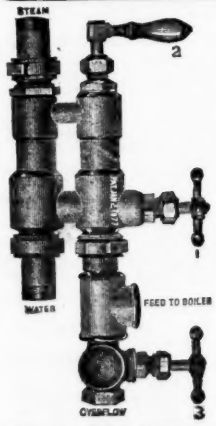

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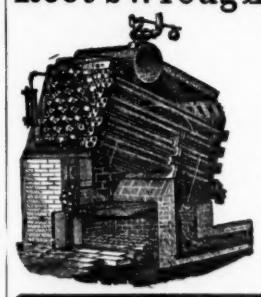

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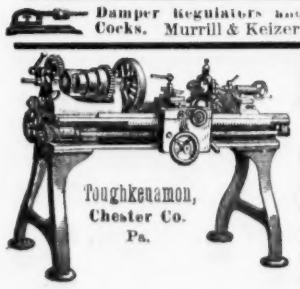

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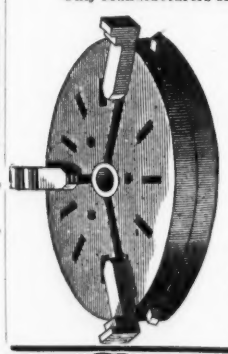

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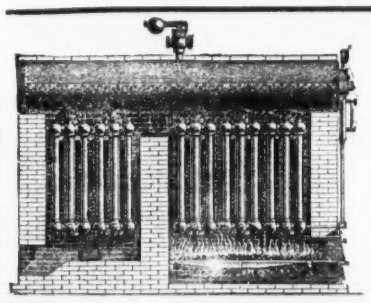

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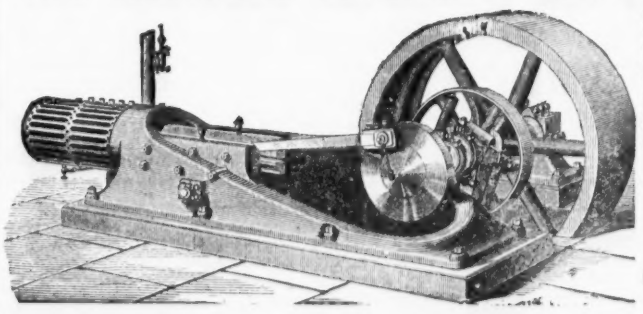

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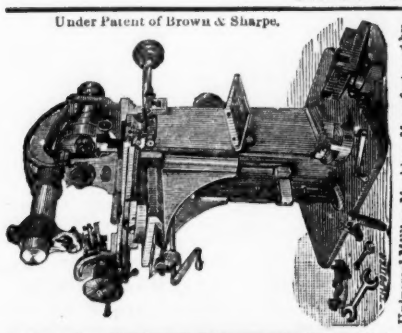

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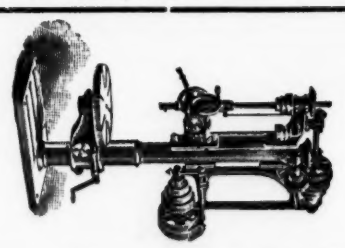

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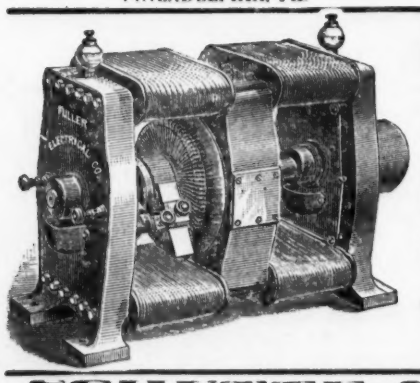

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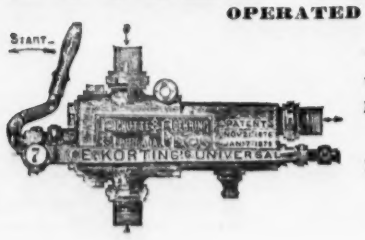

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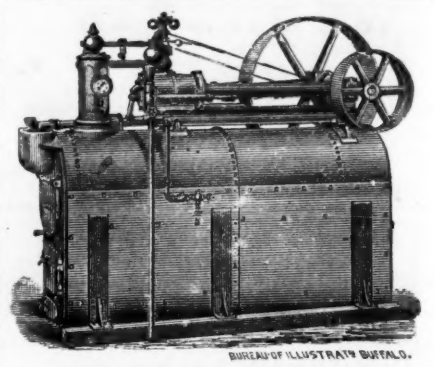

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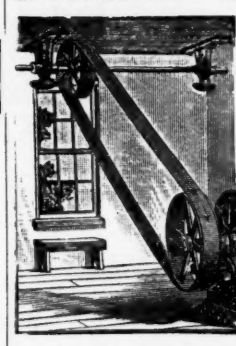

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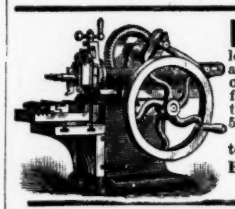

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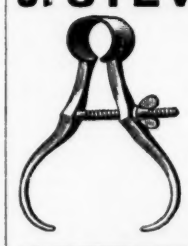

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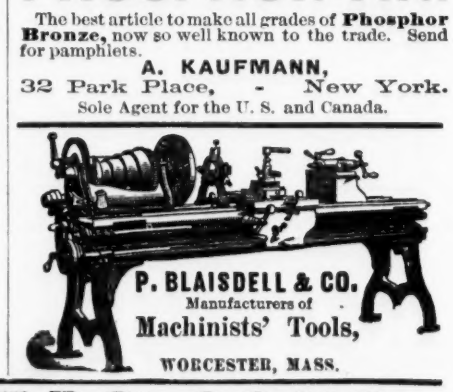

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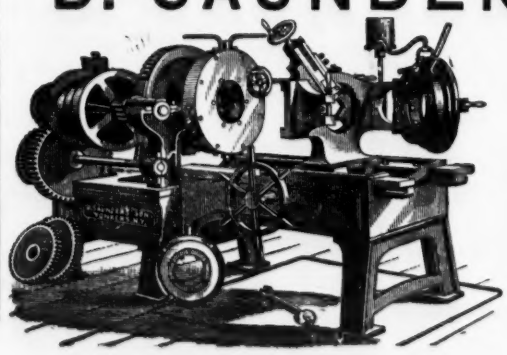

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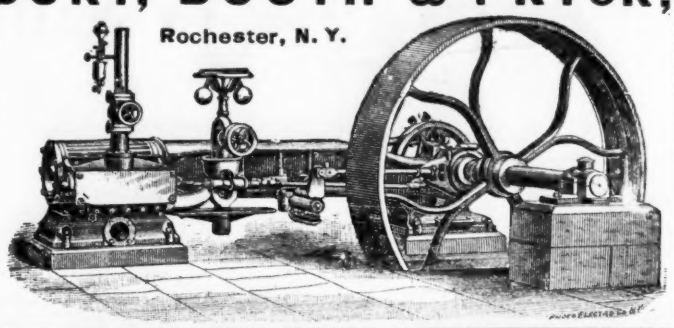

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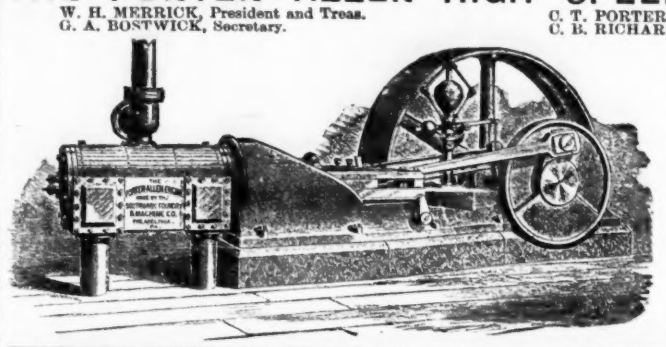

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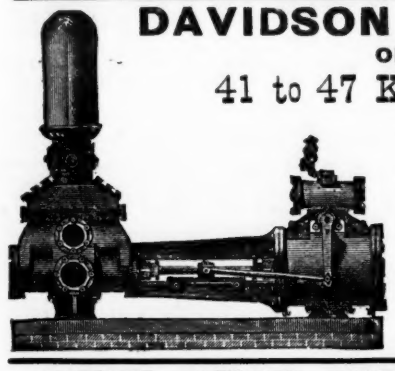

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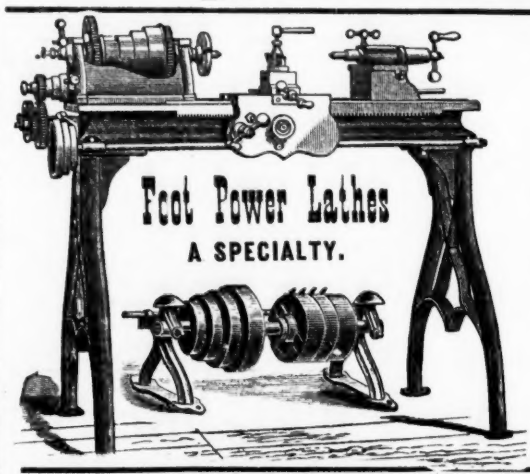

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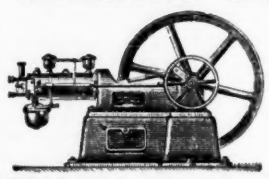

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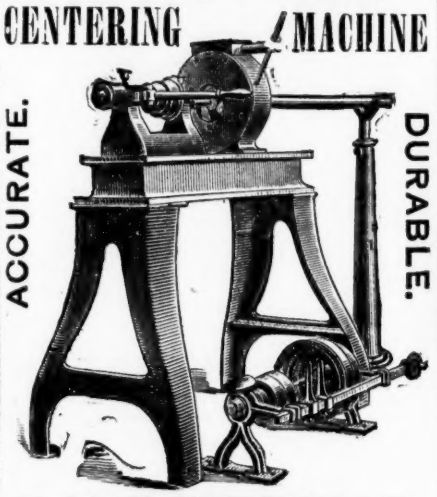

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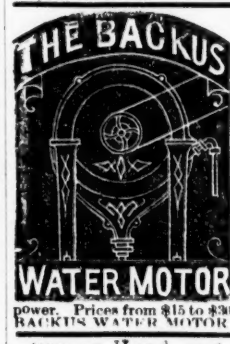

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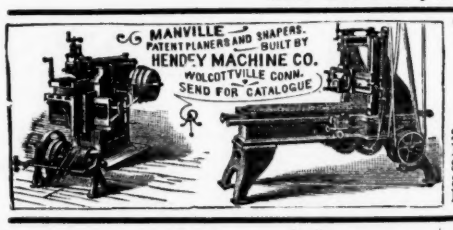

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One Car Axle Lathe. Hewes & Phillips. New.
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One " " 24 in. x 12 ft. Ames. New.
One " " 24 in. x 10 ft. New Haven.
One " " 20 in. x 14 ft. Fifield. New.
One " " 20 in. x 12 ft. Harrington. A1.
One " " 20 in. x 10 ft. Pond. A1.
One " " 20 in. x 10 ft. Fifield. New.
One " " 20 in. x 12 ft. Ames. New.
One " " 20 in. x 10 ft. " "
One " " 20 in. x 8 ft. " New.
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One " " 18 in. x 10 ft. Jones & Lamson, New. 1⅛ in. Hole in Spindle.
Three Engine Lathes 18 in. x 8 ft. Jones & Lamson New.
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One " " 15 in. x 6 ft. Flather's. New.
One " " 15 in. x 6 ft. Jones & Lamson. New.
Three " " 14 in. x 6 ft. Star Tool Co. New.
One " " 14 in. x 6 ft. Hand. New.
One " " 13 in. x 6 ft. Ames. New.
One " " 13 ft. x 4½ ft.
Two " " 11 in. x 5 ft.
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Two " " 7 in. x 2¼ ft. " "
One Planer, 15 in. x 3 ft. Snow. Good order.
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One 24 in. " " Ames. New.
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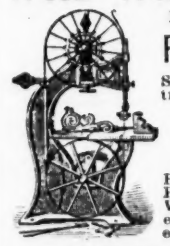

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Variety and Universal
WOOD WORKERS.

Band, Scroll and Circular Saws, Resawing Machines, Spoke and Wheel Machinery, Shafting, Pulleys, etc. All of the highest standard of excellence.

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NEW MACHINE SHOP TOOLS.

List of Sizes for Quick Delivery.

Screw Cutting Engine Lathes

20 in.	swing,	8 ft.	bed.	Wight & Powell.	
20 "	"	12 "	"	"	"
20 "	"	12 "	"	Ames.	
20 "	"	10 "	"	Flather.	
21 "	"	10 "	"	Blaisdell.	
21 "	"	12 "	"	"	
21 "	"	14 "	"	"	
22 "	"	16 "	"	Ames.	
24 "	"	12 "	"	"	
24 "	"	16 "	"	Blaisdell.	
26 "	"	16 "	"	Niles.	
30 "	"	15 "	"	Ames.	
30 "	"	23 "	"	"	
32 "	"	26 "	"	Gleason.	

Iron Planers.

22 in. x 20 in. x 4 ft.	Wheeler.	
24 in. x 24 in. x 6 ft.	Hendey.	
24 in. x 24 in. x 6 ft.	Whitcomb.	
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26 in. x 24 in. x 7 ft.	"	
24 in. x 24 in. x 8 ft.	Ames.	
26 in. x 26 in. x 8 ft.	Pond.	
27 in. x 27 in. x 8 ft.	Whitcomb.	
28 in. x 28 in. x 6 ft.	Gleason.	
28 in. x 28 in. x 8 ft.	"	
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36 in. x 36 in. x 12 ft.	Gleason.	
42 in. x 42 in. x 16 ft.	"	

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2 30 in swing, 15 ft. bed. Engine Lathes. February.
1 22 in. swing, 13½ ft. Bed Engine Lathes. January.
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2 30 in. " Upright Back Geared Drills "

The following in store:

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2 18 in. " 10 ft. " " New.
2 18 in. " 8 ft. " " "
2 16 in. " 6 ft. " " "
4 16 in. " 7 ft. " " "
1 17 in. " 6 ft. " " 2d-hand.
1 17 in. " 7½ ft. " " "
1 15 in. " 5 ft. " " "
1 12 in. " 4 ft. " " "
1 21 in. " 10 ft. Bed Turret Head Lathe.
1 15 in. " 5 ft. Bed Hand Lathe. 2d-hand.
3 12 in. " 6 ft. " " New.
1 10 in. " 4½ ft. " " "
1 Axle Lathe. New.
1 38 in swing Pulley Lathe, new.
1 Round Arbor Box Lathe.
1 36 in. x 36 in. x 9 ft. Betts Planer. New.
2 18 in Hendey Shapers. New.
2 48 in. Swing Radial Drills. New.
1 36 in. Car Wheel Borer. Nearly new.
2 20 in. Upright Drills. Back Gear. New.
1 21 in. Upright Drill. Nearly New.
2 24 in. Harris Upright Drills. Second-hand.
2 Wall Drills, heavy. Second-hand. 60 and 72 in
1 3 Spindle Drill. New.
1 Pratt & Whitney Cam Cutter, 2 heads. Fine.
1 Newton Milling Machine. New.
2 Milling Machines, Lincoln pattern. Second-hand
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1 Sellers Milling Machine. 2d-hand.
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1 Screw Head Slotter. Second-hand.
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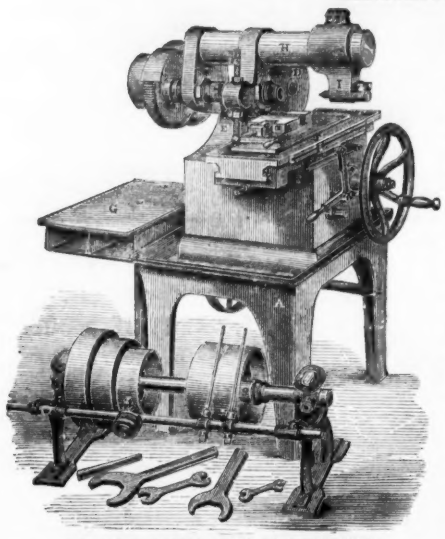

PLAIN MILLING MACHINE.

This machine is designed for ordinary milling operations. The spindle is raised and lowered by set nuts upon the screw C, and moved horizontally by nuts on the front box. The table is fed automatically, the feed being disconnected by the adjustable stop, E. The spindle of the machine is provided with anti-friction bearings and arrangements to close up as wear takes place. Attached to the stand, is a table, G, for holding work, tools, &c. Accompanying the machine are suitable wrenches, also overhead works with adjustable hangers, iron cone, tight and loose pulleys, shipper rods, belt guides, stud and stops. Whole length of table, 28 inches; whole width of table, 9¼ inches; distance of feed of table, 18 inches; height of centre above table, lowest point, 2⅝ inches; height of centre above table, highest point, 6 inches: vise jaws, 6 inches long, 1 15-16 inches deep. Weight, boxed ready for shipment, about 1550 lbs. Price, boxed and delivered at Railroad or Steamer in Providence, $340.

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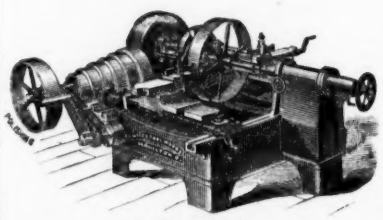

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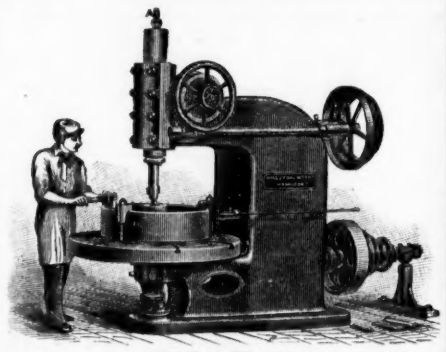

Pulley Borer.

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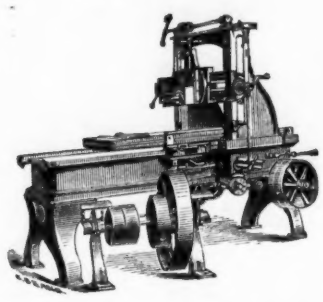

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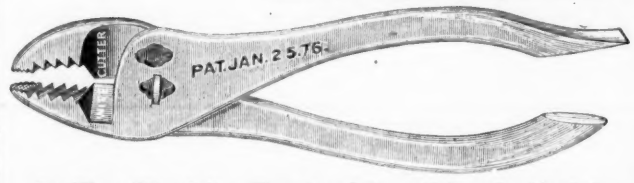

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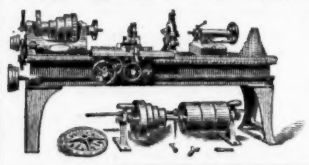

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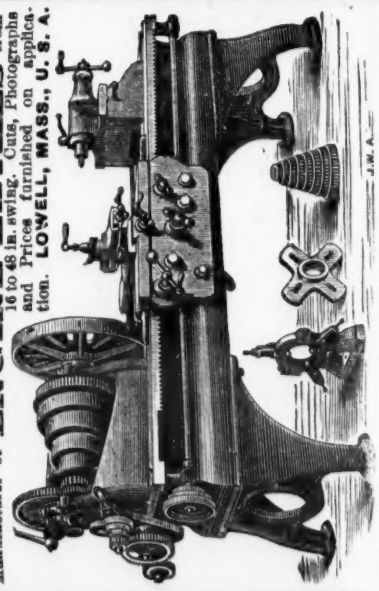

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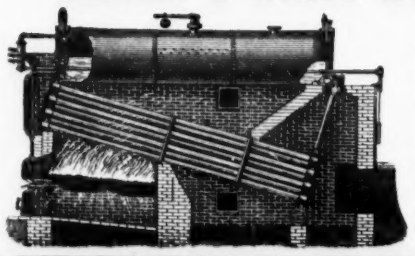

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